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EGYPTIAN VILLAGE LIFE.

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(*With a Coloured Plate.*)

PERSONS who only know the East through the glowing pages of the poet and romancist, and who consequently believe it to be entirely composed of sunshine, birds, flowers, palm-trees, and poetry, would be greatly surprised, on taking the prosaic view of the realities of life, that would be forced upon their notice wherever they went as travellers. Crabbe has for ever destroyed the romance of English village life by his stern and truthful pictures of its privations; but that of Egypt may be said to resemble the worst phases our own would exhibit deprived of a poor-law, or the least honest government.

Few persons look beyond the surface of things, and very many travellers delight in dressing up their narratives according to their own notions, taking only such facts as please themselves, or prop their preconceived theories, and persistently ignoring all others. In this way we obtain delightful books, utterly untrue. Equally blameable are others, belonging to the school of detraction, who have eyes only for evil. In both instances there is truth as a foundation for all; but bane and antidote are not together, hence the two travellers can scarcely be believed as describing the same thing. While drifting down the Nile, the author endeavoured to embody these two styles of narrative, as "a written picture" of a village he had just visited, and in the hope of amusing the reader they are here transcribed:—

AN EVENING IN EGYPT.—(*Couleur-de-rose.*)

The evening closed in, and our excellent captain prepared to make all snug for the night in a charming spot, near a village sheltered by groves of date-palms. Here the playful eddies of the ever-flowing Nile had formed a small bay, in

which our vessel rested peacefully. The high bank, broken into picturesque form by the fall of the rich earth of which it was composed, testified its priceless agricultural value; it was diversified by groups of villagers, who had come forth to greet with smiles the boat of the stranger from afar. Their figures were grand in their simplicity; their slight clothing had never impeded the free action of every limb; its coarse texture gave breadth and boldness to every fold as the parting gleams of sunlight fell full upon them. Young mothers modestly sat by the doors of their picturesque mud-cabins, shrouding their features with a native grace from the glance of the male stranger, but unable to hide the clear and lustrous eye that sparkled beneath the blue head-dress, and beamed with fondness on the infant nestling in the folds of her ample robe, for no clothing impeded the free movements of these children of nature. Thus were nurtured the muscular men who stood by them, and such had been the healthy and venerable patriarchs who sat and smoked their evening pipes in the shadow of their native village. From the humble roofs of many cabins a graceful curl of silvery smoke told of the frugal meal preparing at the close of day. The sun was setting amid gorgeous hues, and a light wind playing coquettishly with the tall and graceful palm-trees, waved them grandly in the air, as if bidding farewell to the sun, as he sank behind the western hills, and gilded with his parting rays the solemn desert beyond.

THE SAME.—(*Couleur-de-jaune.*)

Night was approaching, and the captain of our boat, whose obstinacy gave us frequent reason for just complaint, anchored the vessel in the very centre of a dirty village, a position to be carefully avoided by all travellers on the Nile. The current had washed a semicircular hole in the side of a steep bank, and under pretence of its shelter we were doomed to pass the night in a sort of mud puddle, where all the filthy rags of the dirty people were washed, when ablution became a necessity with them. A steep, broken bank of mud was all that met the eye, on the summit of which crouched many of the half-civilized inhabitants of the place, dressed in rags that neither served for warmth or concealment. Wretched women crouched at their doors, pretentiously hiding faces that are squalid when young, and hideous when old; miserable naked children nestled in their ragged robes; muscular men, of sinister aspect, showed the effect of this early nurture; and dirty elders, in whom age ceased to be venerable, sat in heaps of congenial dirt, telling unpleasant truths to the observant of what the romantic call "pastoral simplicity." A dense smoke

ascended from the cabins, casting out an intolerable stench, the fuel being cakes of dried camel's dung, and added to the abominations accumulated in every corner, as if traps for pestilence had been purposely set by this degraded race. The sun set behind with a lurid glare, as if in anger, and the palm-trees waved like the feathers of a hearse over departed greatness, as the wind sighed hot and heavy amid their branches, and told of suffocating aridity in the bordering desert.

It must be in a better spirit that we look upon the Egyptian villager. To invest his position with "the poetry of the East" would be an absurd falsity, to dwell entirely on his discomfort would be to complete a picture of wrong and hopeless misery. The evil of many taskmasters and irresponsible tyrants infesting every place of government, from lowest to highest, make his life one long struggle against evil influences, and teach him craft and dishonesty as weapons of self-defence. The chief man, or Sheikh, of a village, curries favour with the local governor of his district by aiding his extortion, or supporting his tyranny. An appeal to a legal tribunal is useless without a bribe to the judge; and should an opponent's bribe be heaviest, he wins as a matter of course. The Pasha of Egypt himself is considered fair game for plunder by every local pasha beneath him; nor is this to be wondered at, when he is broadly accused of seizing, at his own will and pleasure, land and other property, on any pretence. To covet his neighbour's goods is but the preliminary step to taking them, according to the current report of his people, sometimes under the colourable pretext of purchase or exchange. But such pretexts deceive nobody, and go for nothing in the estimation of those most immediately concerned in them, who barely listen to such transparent fallacies.

The effect of such an evil system is everywhere visible in Egypt. In a land so wondrously blest by nature, whose soil is the very perfection of fertility, the European cannot but feel how different its people would become under just laws, and a government they could trust in, for due justice, or common honesty. The germ of the glory and power of ancient Egypt lies still in its soil, dormant for many ages, but not dead. The people are energetic, nay, anxious to improve; the greed of gain is as strong with them as with any people, but their powers are restrained by their poverty, and they are still more crippled by the rapacity of dishonest governors. Why should they work, against nature, in a climate where rest is felicity, where nature requires very little, and where industry is rewarded by plundering it of its gains?

Wondrous is the soil of this grand old country; scratch but

its surface and the seed will grow. Nature's bounty is in no part of the world more visible than in the valley of the Nile. A narrow strip of land on each side the river is bounded by the arid desert, where nothing but the Bedouin can live. Where the river overflows, and the mud settles, there vegetation thrives; and so clearly is the line marked that it is possible for a man to place one foot on the rich and fertile soil, and the other on the hot desert sand.

The plough used by the peasantry is a pointed beam of wood, just dragged through the surface soil, deep enough to give a bed to the grain. The wildest weeds, with us, do not grow more luxuriantly than the corn, the lentil, and the tobacco-plant does with them. Everywhere nature laughs, while man sighs over governmental maladministration.

The farmer suffers from extortionate tax-collectors, or thieving pashas; the *fellah*, or husbandmen, and the poor peasant, have deeper griefs; they are liable to be torn from their homes at any hour, by conscription, for the army, and a happy and prospering family may be suddenly reduced to beggary and want by the loss of its necessary master. Cruel are the consequences this has brought about; poor women, with the feeling that their weakness must make a strength out of their necessities, have endeavoured to nullify a fate that hangs over their offspring, and have not scrupled to put out one eye of an infant, or cut away the joint from its forefinger, to prevent the dreaded conscription in after life. This, and ophthalmia, have made more one-eyed men in Egypt than could be found in the same space in any other part of the globe. A fair average of the number of men maimed in the right hand may be gained by reckoning only such as formed the crew of the boat in which the author travelled—it was six out of fourteen, but the others not exempt in this way had but one eye, or had lost the front teeth, of which they had been deprived to hinder them from being able to bite cartridges.

The peasant is also liable to a conscription for labouring purposes, ordered by the local government. He may be taken from the necessary labour of his field or farm to construct dykes, or other works thought necessary. For this he has no pay, and is very hardly worked. When the late Pasha determined on the formation of the Mahmoudie canal, connecting Cairo with the Nile, he formed it by this forced labour. Poor men were torn from their homes, compelled to dig the basin of the canal with any tools they had; the government helped them in no way, not so much as a spade was given to any one, no food provided for them, and no pay. With frantic desperation, the starving creatures scratched at the earth with their fingers, and died by thousands in the trenches.

The world's history can scarcely parallel that of the Mahmoudie canal.

Let us turn to the brighter side, happily it is there in spite of "man's cruelty to man." Affection is the poor man's wealth, the love that can be so strong as to induce an Egyptian mother to maim her child that she may keep him near her, is above all evil governmental influence. Easily made happy in a climate where existence is a pleasure, having few wants to be satisfied, with an eager desire to convert the simplest good into a great benefit, a child-like enjoyment is felt, even by the aged, who have had so much cruel worldly experience. This it is that surprises the European, and the Englishman especially, who delights so thoroughly in depreciating "the good the gods provide him." The faces of these poor people lit up by the gift of a loaf of bread, an orange, or a few halfpence, may furnish a useful lesson to some of the London sybarites who now travel on the Nile.

The cottages are constructed of clay, or built of clay bricks, dried in the sun, and which, in this dry climate, will last for centuries. The mud of the Nile is a very tenacious slime, and the deposit laid every year by the overflow of the river, bakes into thin layers under the hot sun, so that the age of the banks may be reckoned as you may count the age of a tree by the examination of the succeeding layers of bark. The houses are comfortless hovels, devoid of all furniture but that required for cooking. The larger houses have their upper rooms furnished with raised divans, or seats of palm-branch, upon which carpets are spread. Windows are small, for light brings heat, which is to be especially guarded against. The roof of the house is the place where in the evening the family delight to congregate, and often sleep during the night. Some of these houses are made especially gay by rude painting, as shown in the engraving which accompanies this paper. The style of this decoration is evidently traditional, remaining with the people from the most ancient time. It resembles portions of the wall-painting at Beni-Hassan, and other places, where we see the most primitive forms. The houses thus especially decorated are those of such persons as have performed the pilgrimage to Mecca. When a hadji returns, his neighbours help in ornamenting the surface of his dwelling with red, white, and blue washes, in patterns bounded by broad black outlines. The beam over the door has its wooden surface painted still more delicately, but in the same taste, and a circular ornament is usually painted above; sometimes this ornament is a Moorish tile in vitrified tints, but the author was once surprised at finding a plate of the famed old English "willow pattern" inserted over a doorway.

Two distinctive features obtrude themselves on the stranger's notice in an Egyptian village. One consists of the groups of savage wolf-dogs who combine to attack them, but who are equally troublesome to the native who approaches a strange house. The other is the vast flocks of pigeons, whose homes are often in the upper floors of the houses, built high in consequence, with square turrets that give a simple village the look of a fortification. The birds fly far, and forage all day, returning to their houses at sunset in such incredible numbers that it seems wonderful how a farmer can rear a crop subject to their depredations only, yet he has also to feed the wild birds, who are equally abundant. The valley of the Nile literally teems with ornithological life. Like the showman's lions, it "must be seen to be believed."

What will be the future of this prolific Egypt? After many centuries of neglect and decay, will it again arise, and assert its undoubted right to eminence? Is all this native fertility to go for nothing in a world of enterprise? is Monsieur Lesseps and his problematical canal to be the end of western pressure? or is France to point the way to Egyptian emancipation. Already England has made a railroad to Cairo, and conquered the difficulties of the desert route to the Red Sea. We have forced upon the people a knowledge of the mode of making wealth. Our demand for cotton has met with a ready response, the railway is besieged with camels heavily laden therewith; on the banks of the Nile, cotton and sugar mills everywhere appear. The people are willing, if the government can give a guarantee of its good faith; everything depends on that. With European rule, and honest taxation, all would go well; the Nile would again flow through a superabundant garden, inhabited by a prosperous and happy people. When will "the sick man" die, and who is to take his place? Upon the solution of that question depends the greatness of the future.

NORTH POLAR EXPLORATION.

BY CLEMENTS R. MARKHAM.

VOYAGES of discovery have been, since the dawn of modern times, one of the chief causes of the rise of England's power and greatness. The material wealth which they have been the means of pouring into her lap is incalculable. For this alone they will ever be a leading feature in the history of a mighty commercial nation; for this alone they have been fitted out by many a merchant adventurer; and for this they have been incessantly urged upon the attention of many successive Governments. But it is not on account of the commercial advantages that have been derived from the labours of the explorer that those labours are to be most prized, seeing that it is not to wealth alone that England owes her greatness. Exploring expeditions by sea and land have done as much to increase the store of human knowledge as any other kind of research. They have led the way to the creation of that colonial empire, which has spread the Anglo-Saxon dominion far and wide over the earth. They have fostered the spirit of enterprise, and formed a nursery for the pick of our seamen. They have been a school for our best officers, educating them in that calm self-reliance which the presence of danger alone can give. They have been most important agents of civilization, creating a brotherly feeling of sympathy between the nations in times of peace, and giving one bright side even to the horrors of war, for, by the courtesy of international law, a scientific expedition is respected by all civilized nations.

Seeing, then, that expeditions of discovery have helped so largely to make England what she is, it is no less a matter of surprise than of regret that any proposal to continue them, and to complete work which it is the glory of this country to have commenced, should meet with unreasoning opposition from any influential quarter. Surely it cannot be desirable to close the brightest page of our history for ever, for the purpose of saving a little money, or in order not to risk the lives of men whose value to their country arises from the education they acquire by that very process. The grand saying of good Sir Humphrey Gilbert, when advocating an expedition to the Arctic regions, can never be too often repeated:—"He is not worthy to live at all, who, for fear or danger of death, shunneth his country's service or his own honour, since death is inevitable, and the fame of virtue immortal."

Let it once be shown that an expedition of discovery will

add to the sum of human knowledge, that it will lead to valuable scientific results, and that there is no chance of the men who compose it being overtaken by a catastrophe such as that which befel Sir John Franklin's people, and it ought to receive cordial support from public opinion. The collateral advantages that are derived from such expeditions in times of peace are so great that they will be felt by every thinking man. All men may not fully appreciate the value of scientific researches, but no true Englishman can under-estimate the importance of fostering the spirit of enterprise in his countrymen, or fail to desire that the race of men, from Cabot to M'Clintock, which has been formed by expeditions of discovery, should be continued.

What would the glorious reign of Elizabeth be if the stories of Raleigh and Drake, of Frobisher and Fenton, of Richard Hawkins and Grenville, and Gilbert were blotted out? The very name of James I. would fill us with shame, if those of Hudson, Davis, and Baffin were not written in the same page of history. Even the disgrace of having been ruled by his grandsons is slightly mitigated when we find them sending Captain Wood to seek for the North Pole. The readiness with which the statesmen of the last century complied with the suggestions of the Royal Society to send out exploring expeditions wipes away a multitude of sins, and we may condone many acts of misgovernment in consideration of the voyages of Carteret, Byron, Cook, Phipps, and Vancouver. It must never be forgotten that Nelson received no unimportant part of his naval education in the Arctic regions; and that, in the present century, the surveyors and explorers of our navy have been among its brightest ornaments.

The naval enterprise of Great Britain has assuredly been one of the chief sources of her greatness, and it is for the advantage of the country that the spirit which gives rise to it should be fostered and encouraged. Never has this spirit been so systematically ignored, in any period of our history, as at the present moment. Not only is there no exploring expedition engaged in any part of the world, but the most necessary surveys have been starved and neglected. The important proposal to explore the North Polar region, which has recently been made by Captain Sherard Osborn, therefore, comes before us at the very time when its discussion is likely to produce much good, and it certainly deserves most serious and attentive consideration.

I propose, after giving a very brief sketch of the history of the subject, to examine the question whether Captain Osborn's proposal combines those conditions which would justify its favourable consideration by the Government—

namely, sufficiently important results, and the absence of any chance of such a disaster as overwhelmed the Franklin expedition. The great advantages that are invariably derived from enterprises of this nature, independently of their more obvious results, have already been pointed out.

It has been the ambition of British explorers to reach the North Pole ever since "Master Robert Thorn exhorted King Henry VIII., with very weighty and substantial reasons, to set forth a discovery" for that purpose; and as knowledge has accumulated, these reasons have become more weighty and more substantial. Bluff King Hal did not haggle at the expense, nor did he discourage the spirit of enterprise among his sailors. He did the right thing, cordially acceded to the proposal, and sent "two faire ships well manned and victualled, having in them divers cunning men to seek strange regions.* Subsequent voyages to the northern seas in the Tudor age, opened a profitable trade with the then scarcely known duchy of Muscovy; but the most notable expedition of the sixteenth century was that which was led by gallant William Barenton, and his stout crew of Dutchmen. He discovered Spitzbergen in 1596, rounded the northern extreme of Nova Zembla, and performed one of the most remarkable Arctic voyages on record.

In England the merchants of the Muscovy Company were the great promoters of voyages towards the Pole, and as the introducers of the system of keeping log-books, they ensured the preservation of a record of the results of those voyages.† In 1607 they sent bold Henry Hudson, in an eighty-ton vessel, with ten men and a boy, to sail across the North Pole. He discovered the point on the coast of Greenland which still bears his name of "Hold with Hope," traced the ice barrier extending right across from Greenland to Spitzbergen in June; and the name of Hakluyt Head, the extreme N.W. point of Spitzbergen, was also given by Hudson. Having thus satisfied himself of the impossibility of penetrating through the Polar pack to the westward of Spitzbergen, this intrepid explorer next sailed up to its northern end, and examined the condition of the ice in that direction during the month of July. He attained a latitude of 80° 23′; and having ascertained that the pack was as impenetrable in the end of July as it was in June, he returned to England. In 1608 Hudson again sailed with the intention of attempting to effect a passage between Spitzbergen and Nova Zembla, and thus completing the examination of

* *Hakluyt*, iii., p. 129.

† Sebastian Cabot, in his instructions to Willoughby and Chancellor, was the real originator of the log-book.

this, the widest opening into the Polar region. He had with him a crew of fourteen men. On the 9th of June he came to the edge of the pack, in latitude 75° 29′ N., and gallantly attempted to push through it, "loosing for one piece, and bearing roome for another." But he soon discovered that this sailing ice only existed at the outer edge, and in four hours he found the pack to be so thick and firm ahead, as to present an impenetrable barrier. He therefore began to coast along the pack edge, with the ice always "trending on his larboard" from the 9th until the 26th, when he sighted the coast of Nova Zembla.* During this voyage Hudson discovered the Gulf-stream flowing northwards, with divers pieces of drift wood floating on it. This intrepid seaman had now completed the examination of the space between Greenland and Nova Zembla, in two very small yachts; and he had ascertained beyond a doubt, by careful inspection, that an impenetrable barrier of ice stretched along the whole distance, barring the passage to the Pole. He found that on the Greenland coast this barrier came down as low as 75°, that it thence trended to the N.E., until in the meridian of Spitzbergen its outer edge was north of 80°; and that further east it extended south again to about 75°, and stretched away to the coast of Nova Zembla. Thus, "by the means of the great plenty of ice, the hope of passage between Newland (Spitzbergen) and Nova Zembla was taken away."

In 1611, Jonas Poole, and in 1614-15, Baffin and Fotherby, made similar unsuccessful attempts in the direction of Spitzbergen, and in 1676, the Admiralty of Charles II. sent Captain Wood to attempt a passage to the North Pole, but he lost his ship on the Nova Zembla coast. This important and interesting subject was then lost sight of in England for nearly a century, from the time of Wood (1676) to that of Phipps (1774). It was quite clear that for Hudson's cock-boat, and such like craft, the portals of the unknown region were firmly closed. It remains to be seen whether a sharp-bowed screw-steamer will be able to force them open.

The Spitzbergen Seas, however, were a favourite Dutch and English whaling station during the whole of that time, and vessels frequently reached a latitude of 80°, and sometimes of

* On the 15th of June two of his company, named Thomas Hilles and Robert Rayner, saw a mermaid close to the ship's side, and looking earnestly upon them; but a little after, a sea came and overturned her. From the navel upwards her back and breasts were like a woman's, her body as big as one of us, her skin very white, and long hair hanging down behind, of colour black. In her going down they saw her tail, which was like the tail of a porpoise, and speckled like a mackerel. Hudson's editor suggests that this was a seal, and adds the testimony of Dr. Kane, that there is something in the appearance and movements of this animal strongly akin to those of human beings.

81° or 82°, or even 83°,* as the position of the Polar pack varied in the different seasons. When the idea of an expedition to the North Pole was again mooted in the last century, Mr. Daines Barrington, a Fellow of the Royal Society, with great industry and perseverance, collected a number of stories of whalers having frequently attained incredibly high latitudes, and as these fables have since been brought forward as arguments in favour of a Spitzbergen route to the Pole, it will be as well to examine what they are really worth.

The most marvellous of all is that told by Master Joseph Moxon, hydrographer to the King's most excellent Majesty, in 1697. He got most outrageously chaffed by some merry Dutch sailors in a beer-shop at Amsterdam, and gravely published what he had been told,† expecting every "sober, ingenious man" to believe it. Scoresby has pointed out that the instances of voyages having been performed beyond 84°, are in no case given from the direct communications of the voyagers themselves, and he therefore infers that no reliance whatever is to be placed upon these extraordinary instances.‡ Moreover, he finds that nearly all the cases of ships having sailed as far as 82° and 83°, were either given from memory, at a distance of eighteen to thirty years from the time when the alleged voyages were made, or at second-hand. But the strongest proof of the small reliance to be placed on the observations of these whaling captains is to be found in the statements of Captains Robinson, Clarke, and Bateson, who declared they reached 81° 16′, 81° 30′, and 82° 15′, with open water before them, in the very year, and in the same longitude that Captain Phipps was stopped in 80° 48′ N., by a continued smooth, unbroken plain of ice extending to the horizon.

* Parry thought that a vessel might have reached to 83° N. in 1827.

† *A Brief Discourse of a Passage by the North Pole to Japan and China.* By Joseph Moxon, F.R.S., Hydrographer to the King's most excellent Majesty (2nd edition). London, printed by J. Moxon, and sold at his shop at the Atlas in Warwick Lane, 1697.

He says, "About 22 years ago, being in Amsterdam, I went into a drinking house to drink a cup of beer for my thirst, and sitting by the public fire among several people, there happened a seaman to come in, who, seeing a friend of his there who he knew went in the Greenland voyage, wondered to see him, because it was not yet time for the Greenland fleet to come home. His friend, who was a steersman, said that his ship sailed into the North Pole and came back again. I entered into discourse with him, and he did assure me it was true; and told me, moreover, that they sailed two degrees beyond the Pole. I asked him if he found no islands or lands about the Pole, and he told me no, there was a free and open sea. I asked him if they did not meet with a great deal of ice. He told me no, they saw no ice. I asked him what weather they had there. He told me fine warm weather, such as was at Amsterdam in the summer time, and as hot. I should have asked him more questions, but he was engaged in discourse with his friend, and I could not in modesty interrupt them further. I believe he spoke truth, for he seemed a plain, honest, and unaffectatious person."

‡ Scoresby's *Arctic Regions*, i. p. 42.

When Mr. Barrington asked the Dutch skippers themselves, he got the simple truth from them; they said, "We can seldom proceed much higher than 80½°, but almost always to that latitude."* Captain Jansen, of the Dutch Navy, also says, "I do not think our Polar navigators have been further north than 82°."† There is not, in reality, a shadow of evidence that any vessel has ever passed through the Polar pack, and the latitudes attained by whalers have depended on the position of this pack in the different seasons. If it has drifted south late in the year, they have been able to go further north, and Captain Scoresby certainly, in 1806, reached 81° 30′, and found the navigation quite open for many leagues to the E.N.E. If, on the contrary, it has come down early, then they have been stopped in lower latitudes. So much for the whaling fables.

Attempts to reach the Pole were first renewed by the Russian Government, and Vassili Tschitschagoff, in two successive expeditions (1765 and 1766), perseveringly, but vainly attempted to find a way through the ice between Spitzbergen and Greenland. He only reached 80° 30′ N. At that period the President and Council of the Royal Society of England were ever foremost in urging the Government to undertake scientific expeditions. Would that their successors of the present day more closely followed their noble example. In 1773, a memorial was addressed by the Royal Society to the King, to obtain his sanction for an expedition to see how far navigation was practicable towards the North Pole.‡ Two vessels were forthwith fitted out and despatched, under the command of Captain Phipps, who had orders to proceed as near the North Pole as the ice would permit, but to return before the winter should set in. He made the attempt be-

* The Commissioners of Longitude, in 1821, reported that there was no well-authenticated account of any vessel having gone so far as 81° N.

† Captain Jansen (the learned author of that charming chapter on land and sea breezes in Maury's *Physical Geography of the Sea*) has undertaken to investigate this subject, and to examine such ancient journals of Dutch explorers as are still extant in Holland. He tells me that the learned Pontanus, in 1646, said in a speech:—"There are some persons who think the best route to the East is to go to 82° N. of Nova Zembla, or thereabout, because there the days and summers are longer, there is not so much ice, and it does not drift from the shore. Also because the climate is more mild than in 76° and lower down. Although I am convinced that this opinion is true, and that there will be no difficulty in navigating the sea when once in 82°, yet the difficulty is to come there and return." With this learned conviction for his starting-point, Captain Jansen will search for the data whence Pontanus derived his knowledge.

‡ By the Act 16 Geo. III. cap. 6, Parliament offered a reward of £5000 to the person who should first sail beyond 89° N. A new Act on the same subject was passed in 1814 (58 Geo. III. cap. 20). To the first ship that should sail to 83° N., £1000 was granted; to 85°, £2000; to 87°, £3000; to 88°, £4000; and to 89°, £5000. I am glad to see that, in the recent Acts of Parliament sweeping away a great number of Statutes (24 and 25 Victoria, cap. 101, and 25 and 26 Victoria, cap. 125), these rewards for Polar discovery have not been repealed.

tween Spitzbergen and Greenland, but was stopped, like Hudson, and so many others before him, by the Polar pack. He examined the pack edge very carefully, from longitude 2° to 20° E., but never got beyond 80° 48′ N. The expedition of Captain Buchan, in 1818, made the attempt in the same direction, but never got farther north than 80° 34′ N. This expedition, however, made a more extensive examination of the pack edge than the preceding one, having traced it from longitude 10° to 40°, both in the months of June and September, without finding a single lane or opening by which to enter it. Then followed a Russian expedition in 1824, when Admiral Luthe traced the edge of the ice, between Spitzbergen and Nova Zembla, from longitude 62° to 44° E., but he never got further north than 77°.*

These unsuccessful endeavours to find a passage for vessels through the Polar pack between Greenland and Nova Zembla, led Sir Edward Parry to conceive the bold idea of travelling over the ice in sledges and boats during the summer, and thus reaching the Pole.† His scheme was approved by the Admiralty of that day. He sailed in April, 1827, and leaving his vessel in Hecla Cove (lat. 79° 57′ N.), in Spitzbergen, he set off in two boats, with four sledges, and seventy-one days' provisions, on June 21st, going due north. He was stopped by the ice in latitude 81° 12′ 51″ N., and commenced the laborious work of dragging the boats over it on the 23rd.‡ But he had started too late in the season, the pack was much broken up and intersected with lanes of water, and it was drifting rapidly to the southward. After travelling over 192 miles of ice, Parry had only reached a latitude of 82° 45′ N. on July 27th, when he determined to cease his fruitless labours and return. From his extreme northern point a strong ice blink always overspread the northern horizon. Parry certainly met with an unusually open season, and the quantity of rain which fell and rapidly rotted the ice, is proved by the observations of Scoresby, during several years in the same region, to be quite exceptional. He returned to the ship after an absence of forty-eight days, having travelled over 569 miles. The failure of Parry was due to his having

* To complete the story of these vain attempts to penetrate through the Polar pack between Spitzbergen and Nova Zembla, it must be mentioned that a Russian expedition, commanded by Lieutenant Wrangel, started in 1863. That officer lost both his vessels in the ice off Nova Zembla, and escaped in his boats.

† Sir John Franklin had previously drawn up a plan for making this attempt, and volunteered to conduct it.

‡ Parry's weight per man was 260 lbs., a weight which subsequent experience has proved to be too great. 220 lbs. per man is the greatest weight that a party should start with in Arctic travelling. His allowance of food per man was not sufficiently liberal (biscuit 10 oz., pemmican 9 oz., cocoa powder 1 oz., rum 1 gill, tobacco 3 oz. per week).

started too late in the season. There can be no doubt that had he set out in February, when the ice is fixed, instead of the middle of summer, he would have been far more successful. As it is, no European has ever yet reached so high a northern latitude as Sir Edward Parry.

One more expedition requires notice, although it was in a totally different direction. After Hudson had ascertained the ice barrier between Greenland and Nova Zembla to be impenetrable, that worthy old pilot Baffin, in his little vessel, the "Discovery," of fifty-five tons, made an attempt further to the west, entered the bay which bears his name, pushed through the middle pack in twenty-two days, and discovered the entrance of Smith Sound in 1616. This, and not the Polar pack, is the true portal for future North Polar Exploration; but hitherto, only one expedition has attempted to explore it. Dr. Kane, in the little schooner "Advance," wintered there, from 1853 to 1855, and one of his travelling parties, pushing north along the Greenland coast, reached the latitude of 80° 40′ N., came to an open iceless sea, and saw land trending away to the northward, as far as the eye could reach. These Americans were undoubtedly the discoverers of the most northerly known land in the world. Dr. Hayes, a companion of Dr. Kane, has since wintered in Smith Sound, but no account of his proceedings has yet been published.

This completes the enumeration of expeditions which have attempted to penetrate into the North Polar region. The English Government has sent three expeditions to the edge of the ice between Greenland and Nova Zembla, those of Wood, Phipps, and Buchan, during as many centuries, and Parry's boat journey took place in 1827. No attempt has been made since the latter date.

Let us now consider what this vast unknown region is, and what results may be derived from its exploration. If we look at a North Polar chart, we shall see a blank space from 80° to the Pole, only very slightly nibbled at its circumference by Dr. Kane's party, who got forty miles beyond the 80th parallel in Smith Sound, and by Parry, who travelled over the ice into this unknown region for a distance of 165 miles. Here, then, is a vast circular tract of land, and sea, and ice, which is absolutely unknown, with a diameter of 1200 miles, and an area of 1,131,000 square miles.

Our complete ignorance of this large portion of our planet is in itself a strong reason for exploring it. Even if men of science were unable to specify any positive result beforehand, it might fairly be urged that the examination of this vast region must inevitably increase the store of human knowledge, and thus bear rich fruit. But, in truth, we have the highest

scientific authority for asserting that there are many questions of the greatest importance which call for investigation in the North Polar region.

Foremost among them is the subject of geographical discovery—the exploration of the northern side of that wonderful glacier-bearing continent of Greenland, and the completion of our knowledge of any other land that may exist within the unknown area. A very noble and unmistakeably English work is this. To use the words of one who has himself taken no small share in such work in former days, and who is now President of the Royal Society, "It is the greatest geographical achievement which can be attempted, and will be the crowning enterprise of those Arctic researches in which our country has hitherto had the pre-eminence." Phenomena never yet seen by mortal eye will be observed by the bold explorer who reaches the Pole. He will see the sun revolving with a uniform altitude from the day it comes north of the equator in March until it returns in September, its altitude being equal to its declination. He will ascertain new facts connected with terrestrial magnetism, and a series of valuable observations on variation and dip over this unknown area, will be of real practical utility.

One of the greatest scientific *desiderata* of the age is the accurate measurement of an arc of the meridian near the Pole, and this object alone would justify the despatch of a scientific expedition. By the measurement of these arcs in different latitudes, the length of a degree has been found to increase in regular proportion from the equator towards the Pole. The most northern measurement hitherto made is in latitude 66°·20 N. No measurement has been made sufficiently near the Pole, and it is of the utmost importance that this should be done, in order to ascertain the shape of our planet with scientific accuracy. It is not a subject to be touched upon lightly, for few people are fully aware of its difficulties, and of the extreme accuracy which is absolutely necessary in the observations. Still it is to be done, and the western coast of Smith Sound, between latitudes 78° and 82°, is the place to do it.*

The science of hydrography will be advanced, and some of its chief problems connected with equatorial and polar currents will be solved by a Polar expedition. The Polar region may be covered with ice, or considerable seas may be produced by the action of these currents during the summer. General Sabine believes it to be far from improbable that the equatorial stream may produce abnormal effects in the far north, and be the

* On Spitzbergen, which only extends from 76° to 80°, the measurement of an arc will not be so valuable; but it is, however, about to be undertaken by a Swedish scientific expedition.

cause of iceless seas during the summer, teeming with animal life. It is surely a matter of deep interest to discover the actual condition of this secluded ocean, which has never yet been cut by keel of mortal ship.

But although no vessel has ever entered those silent seas, there is every reason to believe that scattered tribes of men will be found on their shores, even up to the Pole itself, wherever the current keeps lanes and water-holes open during the winter. A study of the probable origin and migrations of the Greenland Esquimaux enables us to trace hardy tribes of wanderers from the northern shores of Siberia, where their ruined *yourts* and stone fox-traps were seen by Wrangell, along the whole length of the Parry Islands, which are strewn with exactly the same traces; and thus we follow their long wanderings, until their descendants are found at the head of Baffin's Bay. There the "Arctic Highlanders" at length found a land suited for a permanent abode of human beings, and thence parties may be supposed to have wandered south along the coast of Greenland, and north into the unknown Polar region, wherever there was land and open water. We know that they must have travelled round the northern end of Greenland, for Clavering found two families of Esquimaux on the east coast, to the northward of Hudson's Hold-with-Hope. Scoresby gives instances of stone darts, such as are used by no known people on this earth, having been found imbedded in the blubber of captured whales. These whales had escaped from the mysterious hunters of the Pole, only to yield up their stores of oil to the men of Hull and Aberdeen. The supposed inhabitants of the Polar region must depend on open lanes and water-holes, during the winter, for their existence, for without them there are no walrus, seals, or bears, and therefore no fuel for melting ice. Unacquainted with the use of metals, their implements must be exclusively of bone, stone, or driftwood. Now the discoveries of geologists have recently brought to light the existence of a race of people who lived soon after the remote glacial epoch of Europe, and who were also unacquainted with the use of metals. Their history is that of the earliest family of man of which we yet have any trace, while here, in the far north, there may be tribes living under exactly similar conditions, in a glacial country and in a stone age. A close and careful study of this race, and especially of any part of it which may be met with in hitherto unexplored regions, therefore assumes great importance, and forms a field of research which is well worthy of the attention of future Polar explorers.

The grounds for supposing that human beings have extended their wanderings towards the Pole also justify the

conclusion that the same region teems with animal life. It is peculiarly important that such a region should be examined in the interests of natural history. Not only may there be opportunities for studying the habits of animals as yet little known, and of discovering the long-concealed haunts of those right whales which have deserted Baffin's Bay, but it is also more than probable that new species may be found in the unknown north. Here may be the last hiding-place of that curious manatee (*Rhytina*), which was last seen by Steller in 1741, off Behring's Island, and which is conjectured by Professor Owen to have been separated from its natural habitat in the Indian Ocean, at some remote period, by the rising of the Asiatic continent. The seas which support whales and seals must be tenanted by myriads of fish, and of those minute organisms which are disclosed by the dredging-machine, while the presence of walrus tells us of submarine forests of sea-weed. The Arctic flora, too, is as yet very imperfectly known, as regards either the land or the sea; and Dr. Kane's expedition alone discovered twenty-seven new species of plants. The recent paper by Dr. Hooker, pointing out the geographical distribution of plants in the Arctic regions, suggests the light that may be thrown upon the interesting problems connected with it, and the incalculable value of researches into the botany of the unknown Polar region.*

The investigation of the geological character of the Polar region will throw a flood of light on the world's early history, and will be of incalculable value to science. It must be remembered that no professional geologist has ever been in the Arctic regions, and that the action of the vast glaciers of Greenland, with their mighty icebergs, has never been examined by a trained eye. Yet it is here alone that the condition of that remote period when all Europe was similarly situated, can be satisfactorily studied. The formations hitherto discovered in the Arctic regions, the tertiary lignite of Disco, the carboniferous sandstone of Melville Island, and the Silurian corals, trilobites, and cephalopods of other parts of the Parry group, all indicate a much warmer climate than now exists even in Europe. If similar formations are met with in close proximity to the Pole, we shall learn that there must once have existed conditions of life and heat there which are very different from those now prevailing. We shall receive additional proofs of that great internal heat which appears once to have warmed the earth's crust, and to have produced a rich vegetation in the Arctic zone. The geologists certainly have

* See *Outlines of the Distribution of Arctic Plants*, by Dr. Hooker. *Transactions of the Linnæan Society*, vol. xxiii., p. 251.

excellent reasons for the interest with which they regard the proposal to explore these regions.

There are many strange anomalies, too, connected with the meteorology of the North, as hitherto observed. The data already obtained are altogether insufficient to enable men of science to acquire a sound knowledge of the laws which regulate the climate of the Arctic regions. Captain Osborn has well said that nothing could be more deeply interesting than a careful series of meteorological observations within the Polar area.

These are some of the leading results that will be derived from a scientific expedition to explore the North Polar region, and most assuredly they would amply justify its despatch. There are probably many more additions to our knowledge to be secured in that vast area, of which we cannot form a conjecture now; but we know enough to convince all lovers of science that there is great and important work to be done, and that a naval expedition should do it.

It remains to consider the direction from which a Polar expedition might be undertaken with the greatest probability of success.

There are two accessible approaches to the Polar region, one by the Spitzbergen Sea, between Greenland and Nova Zembla, and the other through Smith Sound, at the head of Baffin's Bay. Looking round the circle formed by the 80th parallel, we see no other suitable opening. Behring's Strait appears to be one, it is true, but beyond it there is the most stupendous accumulation of ice that has ever been met with in the Arctic regions, and the northern openings between the Parry Islands are out of the question. The only routes, then, are those of Spitzbergen and Smith Sound.

The Spitzbergen route was originally proposed by General Sabine, the President of the Royal Society, who developed a plan for attempting it, and it is recommended by four other officers of Arctic experience, Sir Edward Belcher, Admiral Ommanney, Captain Richards, and Captain Inglefield, and also by Admiral Fitz-Roy. The idea appears to be that a base or depôt should be established in Spitzbergen, whence well-found screw steamers may do battle with the pack to the northward for two or three years, if need be, until success is achieved.

The argument in favour of this route is founded on the following considerations:—It is known that the Gulf-stream flows up between Spitzbergen and Nova Zembla, and that it issues south again as an Arctic current. This warm indraught is supposed to cause a navigable ocean, free from ice during the summer; and one theorist maintains that even in the depth of an Arctic winter a vessel may sail without obstruction

across the North Pole. But the facts upon which the theory of a Polar basin rests are that Wrangell met with thin and broken ice at a distance of about twenty miles from the Siberian coast, in February, denoting open water; and that Anjou saw the same water-holes off the islands of Kotelnoi and New Siberia.* When Barents wintered in Nova Zembla, in 1596, he also saw open water to the northward, in March, after a strong S.E. gale; but as soon as it began to blow from the N.W., the ice returned from that quarter. He naturally concluded, from this movement of the ice, that there must have been open water to the north, into which the ice was blown. The Russians call these water-holes *Polynias*, and they are occasionally seen in all parts of the Arctic regions, even in the depth of winter. They are caused by currents, and in Baffin's Bay also by movements of icebergs. It is obviously absurd for a man standing on the ice, and finding open water before him, to call it an "immeasurable ocean," when he can only see a distance of a few miles. An argument in favour of a warm Polar climate has also been derived from the supposed influence of unceasing sun-light during six months. Scoresby long ago calculated that, at the summer solstice, the influence of the sun is greater at the Pole than at the Equator by nearly one-fourth. But he points out that, on the same principle, the influence of the sun at 78° N. is only $\frac{1}{44}$th less than at the Pole, and also greater than at the Equator.† Now at 78° N., the mean temperature of the year is 17° Fahr., and ice is formed during nine months in the Spitzbergen seas, neither calm weather nor the proximity of land being essential to its formation. How, then, can the temperature further north be entirely different? It may readily be admitted that those parts of the Arctic zone where there is much land, such as Greenland and the vicinity of the Magnetic Pole, are colder than portions where there is a wide expanse of ocean; but to suppose that this difference is so great as to affect the existence or non-existence of ice is wholly inadmissible, even if the Polar pack did not yield a tangible proof that ice *is* formed round the Pole. Scoresby, by a careful calculation, finds the probable mean annual temperature of the Pole to be + 10° Fahr.

The only sound conclusion that can be arrived at from the above considerations is that the Polar region is frozen over during the winter, with occasional lanes and water-holes kept open by the currents; that this ice drifts south in the summer and autumn, and is gradually loosened and melted at its southern edge by the action of the Gulf-stream, the swell of

* The open water of Middendorf, off Cape Tainiyr, was seen in *August*, when it equally exists in all parts of the Arctic regions.

† Solar influence is proportional to the sines of the sun's altitude.

the ocean, and, in some seasons, by heavy falls of rain; and that young ice forms again, so as to impede and eventually to stop navigation, in September. An expedition taking the Spitzbergen route must therefore force its way through the Polar pack drifting south, before this young ice begins to form, otherwise the season for exploration is lost.

The vital question now arises—what is the width and condition of this pack? Parry, in 1827, ascertained that it was at least 192 miles broad, by walking over it, and at his extreme northern point in 82° 45′, a strong ice blink was seen on the northern horizon. This was in the end of July. We may, therefore, take its average width at that time of the year to be about 250 miles. It is hoped that an expedition may enter the pack between Spitzbergen and Nova Zembla towards the end of July, under favourable circumstances, notwithstanding the failure of all former attempts. This hope is based on the great advantage that steamers have over sailing vessels, and on the presumed action of the Gulf-stream in melting and loosening the pack. All then depends on the time that it will take for vessels to force their way through it.* Let us see upon what grounds we may calculate the probable length of this detention. The width of the Polar pack in the end of July is not less than 250 miles; that of the middle pack in Baffin's Bay is generally about 172. Now the average detention in Baffin's Bay, calculating from the time taken by the six expeditions, assisted by steam power (for we may now leave sailing vessels out of the question) has been twenty-two days. But by holding on to the land ice very little ground is ever lost in Baffin's Bay, and the existence of the land floe makes eventual success almost a certainty; while between Spitzbergen and Nova Zembla there is a drifting pack with no land ice to assist navigation, and progress is dependent on the chance of lanes opening in the right direction. With extraordinary luck, however, steamers might bore their way through this 250

* The analogy which has been attempted to be drawn between the pack in the Southern hemisphere, through which Sir James Ross forced his way (*Southern Seas*, ii. p. 183), and the Polar pack, between Spitzbergen and Nova Zembla, is entirely delusive. On December 18th, 1841, Sir James entered the pack, in latitude 60° 50′ S., and, after being beset in it for fifty-six days, at last emerged into open water on February 2nd. This pack was 800 miles wide. On the 24th he was obliged to relinquish all further exploration, on account of the formation of young ice, which threatened to freeze the ships up for the winter in a most dangerous position, but fortunately they were saved by a strong breeze (ii. p. 203). Thus he only had three weeks of navigable season left, after getting through the pack. This pack in the Southern hemisphere was met with in the temperate zone, after having drifted through hundreds of miles in a boundless ocean, and become loose and broken. The North Polar pack, on the contrary, is but a short distance from the place of its formation, and is in a confined sea surrounded on all sides by continents.

miles of pack in forty days, and reach open water beyond, towards the end of August. If an attempt is made to take the pack earlier in the year, it will of course be found to be much wider and closer, and the detention will be proportionally longer. Under fortunate circumstances, steamers may, perhaps, get through the pack in August, so as to have about a fortnight left for North Polar exploration in the supposed open water to the northward, before the young ice begins to form. It must be remembered that dense fogs prevail in summer wherever there is a large surface of open water, in the Arctic regions. If a navigable sea exists, however, some interesting discoveries may be made in its hydrography and fauna, and a series of useful magnetic observations may be taken. But the generally admitted absence of land* on that meridian precludes the idea of wintering in safety, and destroys all chance of obtaining many of the important scientific results which have been enumerated as attainable from North Polar exploration, when undertaken in the right direction. The objections to the Spitzbergen route are that the chances are against a successful passage through the Polar pack; that, even should this obstacle be overcome, there would be so little of the navigable season left that scarcely anything would be done; and that none of the objects of North Polar exploration would be attained in the event of failure, very few in the less probable event of success; while, if the vessels are prevented from returning before the winter sets in, they will be in extreme peril.†

We now come to the consideration of the Smith Sound route. This route is recommended by a great weight of authority—by Sir George Back, the Nestor of Arctic exploration; by Admiral Wrangell,‡ the discoverer of the northern shores of Siberia; by Admiral Collinson; by Sir Leopold M'Clintock, the highest living Arctic authority; by Sherard Osborn, whose admirable paper first brought North Polar

* Some of the advocates of the Spitzbergen route speculate on the existence of land; but the whole argument in favour of that route is based on its supposed absence. This supposition is founded on the absence of icebergs and of any mud or débris on the ice, of which the Polar pack is composed. The argument is perfectly sound so far as it goes.

† Open lanes and water-holes, no doubt, exist throughout the winter in the Polar region, caused by currents, and the ice is thus kept in occasional motion by gales of wind. It is this condition of the ice which would cause the extreme danger of wintering in the Polar pack north of 80°, at a distance from any land. The ships would be kept in motion, and perhaps dashed about amongst heaving blocks of ice in a gale of wind, at a time of year when the incessant night and the intense cold render navigation out of the question. The men would find it impossible to work aloft, and the running rigging would be frozen too hard to reeve through the blocks.

‡ See *Royal Geographical Society's Journal*, vol. xviii., p. 19 (1848).

exploration into notice; by Vesey Hamilton, whose Arctic experience is only second to that of M'Clintock; and by Captain Maury, the great American hydrographer.

Smith Sound is ascertained to be a broad strait leading into the unknown Polar region, and its shores are the most northern known land in the world. They are, therefore, the best point of departure whence sledge parties may push onwards over the Polar region, and the best wintering station for vessels forming a scientific expedition. It is proposed that two well-fortified gun-boats, of 60-horse power, should proceed up Baffin's Bay to Smith Sound; that one should winter near Cape Isabella, at its entrance, and that the other should go further north, so as to winter at a distance of about 300 miles from her consort. There is no doubt about vessels being able to reach the entrance of Smith Sound, at the head of Baffin's Bay, every summer. The ice drifting from the seas, whose portals are Smith, Jones, and Lancaster Sounds, forms what is called the *middle pack* during the summer, stretching across the centre of Baffin's Bay; while the head of the bay, upon which the above sounds open, is always free of ice in the summer, and is called the "*North Water.*" The *middle pack* is about 170 miles wide, and the reason why it may always be passed, while the Polar pack cannot, is that on the eastern side of Baffin's Bay there is an indentation called Melville Bay, filled with ice firmly attached to the land, and known as the *land floe.* Vessels make fast to this *land floe,* while the middle pack drifts past, and thus creep up through a lane of water which is occasionally left between the fixed and drifting ice, sooner or later reaching the "*North Water.*" Out of thirty-eight exploring vessels that have gone up Baffin's Bay since its discovery in 1616 not one has been lost, and not one has failed to reach the "*North Water*" when the necessary conditions of success have been observed—namely, arrival at the edge of the ice early in the season, and sticking to the land floe. Two only* out of thirty-eight have failed, and neither adhered to these conditions. The whalers do not persevere in the attempt, unless they can pass through early in the season, yet, in twenty-seven out of thirty-two years, from 1817 to 1849, they succeeded in reaching the "*North Water.*" In 1849 a whaler reached the "*North Water*" by the 12th of June, and in the years 1825, 28, 32, 33, and 34

* One of these was the "North Star," in 1849. She took the pack, and was drifted across Melville Bay, not getting clear of the ice until the navigable season was over. She started very late in the summer. In the very same year a whaler (the "St. Andrew") reached the "*North Water*" on June 12th, a clear proof that if the "North Star" had started early, she would have got through successfully.

the whole fleet of whalers got through early in July. It must be remembered that the whalers do not persevere after the middle of July, while there will be time for a discovery ship to reach Smith Sound, even if she does not get through, before the end of August. It may be counted upon with certainty that two screw-steamers of 60-horse power will get through the *middle pack* (on an average) in about twenty-two days, if they start early in the season, and that they will reach the "*North Water*." The "*North Water*" means Smith Sound, for it always extends to the entrance of that great opening whence Captain Inglefield in 1852 saw open water to the northern horizon, stretching through seven points of the compass.

The two gun-boats would winter about 300 miles apart, one near Cape Isabella and the other near Cape Parry, both on the weather or western side of Smith Sound. The march to explore the Polar region would commence in February, along the coast which stretches to the northward. The ice is always firm, and fit for travelling near the shore, from February to May; and this circumstance led Wrangell to advocate the Smith Sound route, for he well knew that his *Polynias*, or open lanes of water, were not encountered until he advanced a considerable distance from the coast. The distance from Cape Parry to the Pole and back is under 1000 miles; so that a party going to the North Pole, and travelling at the rate of about ten miles a day, would be back by the middle of May. Mr. Arrowsmith places Cape Parry in 81° 56′ N., or 484 miles from the Pole; and Dr. Kane's steward saw land stretching away to the north as far as the eye could reach. Give us only 184 miles of land north of Cape Parry, and a sledge journey to the Pole is a matter of calculation* if performed during the winter and early spring. The discovery of the North Pole by this route does not depend upon a drifting, treacherous pack, upon the opening or closing of leads through the ice in the right direction, or upon a theoretical Polar basin, as is the case in the Spitzbergen seas. By the Smith Sound route the discovery is a certainty, so far as human calculation can make it so. Sir Leopold M'Clintock has brought the art of sledge travelling to such perfection, that this may be affirmed with perfect truth. Much has been said, by objectors to this route, about the impossibility of dragging heavy boats over the ice. All who are acquainted with M'Clintock's

* A sledge party, commanded by M'Clintock, has walked 1220 miles in 105 days; on another occasion, 1330 miles. Mecham did 1203 miles, Richards 1093, Osborn the same. Allen Young 1150, and Hamilton 1150. Sir Leopold M'Clintock says that a single sledge may carry sixty days' provisions, and go over 600 miles of ground, without assistance from depôts.

system of travelling, know well that such an idea would never enter his head. He would probably supply each sledge with a very light India-rubber boat, and narrow lanes of water would never stop him. If he arrived on the shores of a great navigable ocean in an Arctic winter, then, of course, his progress would be arrested. But, at the same time, a marvellous discovery will have been made, and his researches will be turned in other directions, leading to results of equal value and interest. The northern side of the Greenland continent will be carefully examined, as well as all the land to the westward. We may rely upon it that immense results will be insured by the exertions of scientific explorers wintering for two seasons in Smith Sound, that every branch of science will be enriched by their labours, and that, even if success is denied them in their endeavours to reach the Pole, their achievements in other directions will repay the expenses of the expedition a thousandfold.

The advantages of the two routes will not bear comparison. The Spitzbergen route offers, in the event of success, a chance of reaching the Pole, and the opportunity of exploring the supposed Polar basin; but everything must be done very hastily, and therefore inefficiently, during the brief navigable season. In the probable event of failure the vessels will have accomplished nothing. They will have been a month or two struggling in the pack, and will at last be drifted out again, either whole or in pieces.

The Smith Sound route, on the other hand, offers the discovery of the North Pole, of the northern side of Greenland, of the land to the westward, and all the numerous results in every branch of science, which are expected from a North Polar expedition. Moreover, the explorations will be made by sledges, and therefore carefully and thoroughly. In the event of failure in securing the main object, all the other results will be attained; so that, under any circumstances, good and useful work will be done.

By the Spitzbergen route there is the bare chance of doing little, by the Smith Sound route there is the certainty of doing much.

Three objections have been raised to another Arctic expedition: first, that it will be no use; secondly, that it will be dangerous; and thirdly, that it will be expensive. After what has been said of the great and beneficial results, both direct and collateral, which may be expected from North Polar exploration, it is unnecessary to dwell upon the first objection. There are many people who, with the *Times*, are altogether incapable of comprehending that there can be anything worth doing, which does not promise good interest on

outlay, in hard cash; and to speak to them of advantages other than an actual money profit on goods delivered, would be a mere waste of breath. Yet even they might be reminded of the actual commercial profit that has been derived from Arctic Expeditions. The voyages of Willoughby and Chancellor opened the rich trade with Archangel. The discoveries of Hudson led to the lucrative Spitzbergen whale fishery, those of Davis and Ross to the equally remunerative fisheries in Davis Strait and Baffin's Bay. The discoveries of the Danes in Greenland have yielded supplies in ivory, cryolite, and graphite. The Russian and Arctic expeditions have opened a rich trade in fossil ivory. Lastly, the voyages up Barrow's Straits have resulted in an extensive series of magnetic observations of practical utility to navigation.

But the public have a right to inquire closely whether any future expedition would incur even the remote possibility of such a fate as befel the "Erebus" and "Terror," and to this objection a satisfactory reply may properly be demanded. There is no analogy whatever between the ill-fated expedition led by Franklin, and that which, it is hoped, will be despatched to Smith Sound for North Polar exploration. No one feels this more strongly than the noble-minded widow of that great explorer. In the latter case, a vessel will be stationed at a point whence annual communication with England is easy and certain, and whence a retreat to the Danish settlements in Greenland is perfectly devoid of all risk; while Franklin was sent into an unknown region, without a thought of providing for his safe retreat in the event of disaster. Had one of Franklin's ships remained off Cape Warrender, at the entrance of Lancaster Sound, and the other not gone beyond Cape Riley, they would have been quite as safe as if they had never left Greenhithe. The Smith Sound exploring vessels, stationed at Cape Isabella and Cape Parry, will be in exactly similar positions, for Smith Sound, like Lancaster Sound, opens on the "North Water" of Baffin's Bay. It is not, however, to be supposed that there will be no individual danger to those who gallantly come forward to serve in a Polar expedition of discovery. On the contrary, it will be a service requiring great powers of endurance, courage, and self-reliance of a high order, and indomitable resolution. But it is the desire to overcome difficulties and dangers, and to emulate the deeds of former naval worthies, which induces men to volunteer for such service. Suffice it to say that the climate is the healthiest in the world, and that a retreat from Smith Sound to the Danish settlement of Upernavik in summer, if it should become necessary, is easy, and free from danger.

The objection on the score of expense will doubtless be raised with more sincerity, at least, than is this unworthy attempt to discourage naval voyages of discovery on the ground of danger. But if the despatch of a scientific expedition, the results of which will be shown to be important by the leaders of science, is to be refused owing to the trifling expenditure it will occasion, let us be told so at once; and let not those who would advocate any iniquitous war with China or Japan, in pursuit of the main chance, protest against the imaginary risk of a scientific expedition. M'Clintock's voyage, and he was absent two years and a half, cost £8400. Parry's attempt to reach the Pole cost £9900. The actual expense of a Polar expedition up Smith Sound, consisting of two of those numerous 60-horse power gunboats which are now lying idle, or being sold to be broken up, would not exceed £30,000. Now if the solution of the greatest geographical problem that remains to be solved, and the attainment of those scientific results which have already been enumerated, are not considered worth the expenditure of so trifling a sum—an expenditure which would be richly and abundantly repaid—the character of the English people must be strangely altered. Certain it is that our forefathers would have held that such a sum appropriated for such an end was money well spent; and there is good reason for the belief that if the subject receives full and fair consideration, the public opinion of the country will now approve the despatch of a North Polar expedition. During the last ten years the sum of £150,000,000 has been spent upon the navy, out of which only a 230th part has gone to the scientific department of the profession. Surely it is not much to ask that this infinitesimal proportion should be imperceptibly augmented, in order that an important and valuable service may be performed!

An expedition for North Polar discovery, by way of Smith Sound, will yield most useful scientific results, will add largely to the sum of human knowledge, while it will run no risk of a catastrophe such as that which befel the crews of the "Erebus" and "Terror." For these reasons it deserves such cordial support from the public opinion of the country as will induce the Government to undertake it. When it is remembered how beneficial are the indirect advantages invariably derived from voyages of discovery, and how important it is that naval officers should have some nobler career opened to them, in times of peace, than the ceaseless round of holystoning decks and cleaning brass work, an interest will be felt in these voyages, even by men who do not personally appreciate their scientific results. The same enterprise, courage, endurance, and presence of mind are required to conduct an Arctic

expedition as to face an enemy in the field; but in the former case those qualities are exercised in advancing civilization, extending knowledge, and exciting friendly sympathy and interest throughout the world; in the latter, they are wasted in the deplorable operations of war.

NOTES ON FUNGI.—No. III.

BY THE REV. M. J. BERKELEY, M.A., F.L.S.

WHITE-SPORED AGARICS—RINGLESS OR EXCENTRIC.

(*With a Tinted Plate.*)

It is not strictly correct to say that there are no ring-bearing species in the remaining subdivisions of the white-spored Agarics, but as the few which have rings belong to the division which is characterized by the pileus being always more or less excentric, there is no great difficulty about the exception.

The subdivisions or subgenera are *Tricholoma*, *Clitocybe*, *Collybia*, *Omphalia*, *Mycena*, and *Pleurotus*, in all of which the part which bears the fructifying surface is confluent with the stem. The first which requires notice is *Tricholoma*, whose name is derived from θρὶξ, a hair, and λῶμα, a fringe or border; but the name is deceptive, for if anything like a veil is ever present it is quite rudimentary; at any rate, its threads are never interwoven into anything like a membrane, so that no permanent veil must be looked for. The grand point of distinction consists in the gills always being sinuated or emarginate behind (Fig. 1),* while the stem has no distinct bark-like coat of a different consistence from the rest. As observed before, some *Armillariæ* are distinguished only by their ring, while *Amanita* and *Lepiota* have the hymenophorum quite distinct from the stem. All the species grow on the ground, and most of the large ones are esculent; indeed, no species which is confessedly poisonous is contained in this subgenus. Where, however, experiments are made in doubtful species, great stress should be laid on the absence of any disagreeable taste or smell.

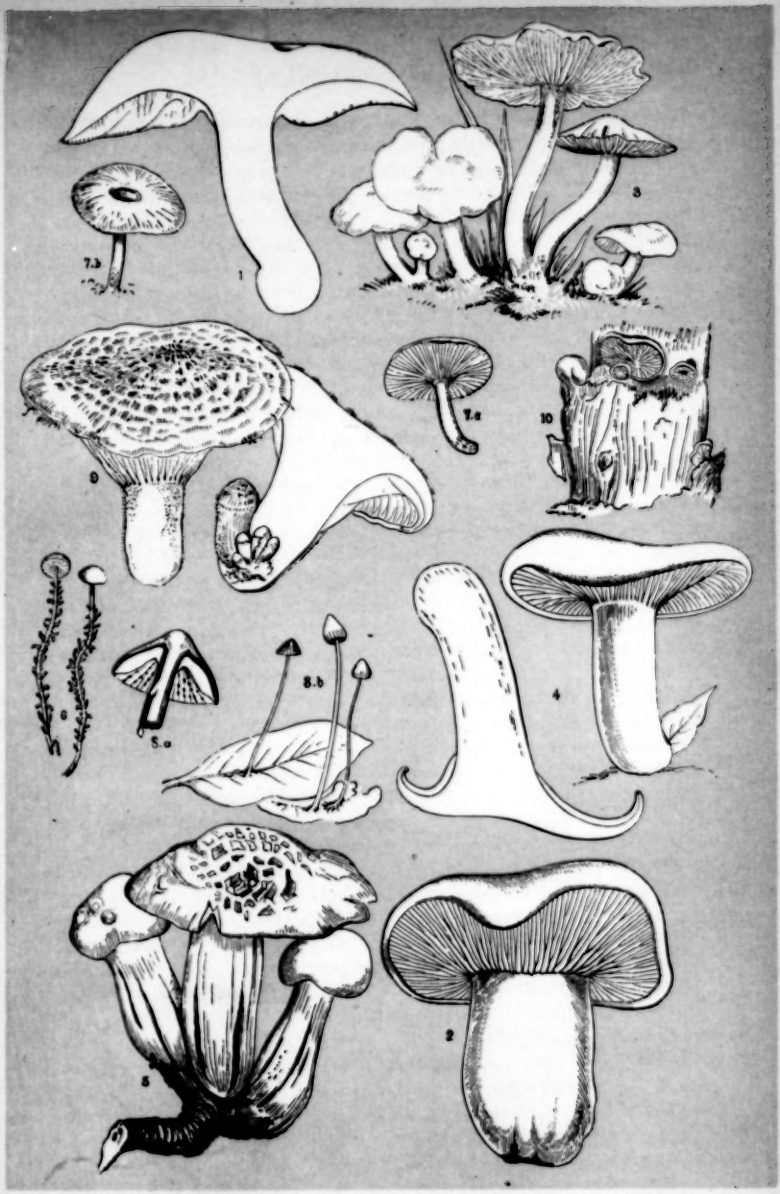
The primary sections of *Tricholoma* rest on the presence or absence of any viscid coat. It must be remembered, however, that a species may be perfectly dry in hot weather, which is dripping with a viscid moisture when wet. Some of the viscid

* A vertical section of *A. colossus*, a magnificent Swedish species, which is chosen for illustration as it is so very characteristic.

species have pure coloured gills, which do not change their tint as they grow old, while others are more or less defaced with reddish-brown spots. One or two in either group are abundant in our woods, but they do not recommend themselves to notice as likely to prove good articles of food. Amongst the species which are not viscid, the cuticle of the pileus (2) may break up into more or less delicate threads or downy fascicles; it may be rigid (3), and present granules or smooth scales; it may be perfectly dry (4), and though minutely silky at first, be quite smooth when full grown, and neither floccose nor scaly; it may be moist, though not viscid in damp weather, as is the case in the remaining sections, and spotted (5), where drops of water have rested, or minutely cracked; the substance may be spongy and absorbent (6), and greedy of water, though when saturated it does not look semi-transparent, or when dry become opaque, or, in other words, it is not hygrophanous; while, finally (7), it may be hygrophanous, a very important distinction.

The section which contains the most valuable esculents is the fifth, where the species are mostly of early growth. *Agaricus gambosus*, which is the true St. George's agaric, though a species nearly allied to the common mushroom has been mistaken for it, is often extremely abundant in exposed grassy pastures, after the first copious spring rains in April or May, and is one of the best esculents in the subdivision. It is much eaten on the Continent, though generally neglected in this country, and one or two allied species are strung upon threads and dried for winter use. The pileus, when fully grown, if the weather is dry, has often a shining silky look, and closely resembles a cracknel. Of this we give a reduced figure, as it is highly characteristic of the subgenus (Fig. 2). *Agaricus personatus*, commonly known under the name of Blewits, belonging to the sixth section, is sometimes sold in Covent Garden Market, and is occasionally eaten. It occurs rather late in the year, remaining till the frost destroys, and is often sodden with moisture, in which condition it is not worth notice. It may be readily known from its very obtuse smooth pileus, and the stem being more or less rough with down or fibres, and prettily tinged with violet. Woodland forms are sometimes of a brighter tint. It often forms large rings. In the fourth section there are some interesting but disagreeable species. *A. sulfureus*, which is remarkable for its sulphur-yellow colour, has a decided scent of gas-tar, while *A. inamœnus* is scarcely less unpleasant, though it does not seem to attain the same intensity of odour with us as it does in Sweden.

Agaricus carneus, a small species belonging to the fourth section, which not unfrequently occurs in exposed pastures, remarkable for its neat form and pretty pileus, of a tint between



FUNGI.

1.—Agaricus colossus.
2.—A. Gambosus.
3.—A. carneus.
4.—A. geotropus.
5.—A. fusipes.
6.—Agaricus racemosus.
7.—A. affricatus.
8.—A. sanguinolentus.
9.—A. dryinus.
10.—A. applicatus.

red and flesh colour, may be cited because, in the character of the stem, it approaches *Collybia*, though the pileus and gills are quite those of the truest *Tricholoma*, as will be seen by the subjoined figure (Fig. 3).

Clitocybe, a name derived from κλίτος, a sloping, and κύβη, a head, is the designation of the next subgenus. It is closely allied to *Tricholoma*, but is distinguished by the gills not being sinuated behind, but regularly attenuated and running down the stem. Few of the species are eaten; but *Agaricus nebularis* and *geotropus*, or, at least, that form of the latter which is figured by Batsch, under the name of *A. subinvolutus*, of which we give a reduced figure, are excellent (Fig. 4). We have partaken of the common form, under the auspices of Dr. Badham, but did not consider it good, though, like several other species of the subgenus, it is wholesome.

The species are often rather difficult of determination, as the differences are less striking than in most other subgenera. The main divisions consist of—(1), those with an obtuse pileus, like *A. nebularis*, which at length becomes more or less plane; (2), species with an irregular, often sub-oblique pileus, with unequally decurrent gills; (3), those which, though at first umbonate, become at length entirely infundibuliform, with long and equally decurrent gills. In all these the pileus is not hygrophanous as in the three following—(4), species with a thin, almost membranous, cup-shaped pileus; (5), those, on the contrary, which are subcarnose, convex at first, then plane or depressed, with the gills adnate, or only very shortly decurrent; while (6) the last has again a thin pileus, which is often scaly or perfuraceous.

In the first section, besides *A. nebularis* already mentioned, which is conspicuous amongst leaves in woods for its pale cinereous, somewhat pruinose pileus and elastic fibrillose stem, and which is very highly esteemed as an esculent, one of the most remarkable is the greenish *A. odorus*, not uncommon in woods, which diffuses a strong scent of aniseed. In the second, *A. fumosus*, which sometimes forms dense tufts, is one of our best known species. In the third, we have *A. giganteus* and *maximus*, which acquire a diameter of a foot or more, and the latter of which forms sometimes rings in woods many feet across, besides which there are many allied British species, some of which are extremely common. In the fourth section, one of the most common towards the end of autumn is *A. cyathiformis*, its brown, cup-shaped, hygrophanous pilei being conspicuous both in woods and pastures; in the fifth, *A. fragrans* will obtrude itself on notice by its fragrance, resembling that of *A. odorus*, though its form and colour are different; while in the sixth, we have the commonest of all

woodland species, *A. laccatus*, where it is sometimes of a rufous flesh colour, but sometimes of the most lovely amethyst, the cuticle being always more or less mealy. Other varieties of this common species occur; one, which combines both colours, which I have gathered in fir-woods in Scotland, and another of a bright orange yellow.

In *Collybia* (from κόλλυβος, a piece of money) we enter upon another series, in which the hymenophorum is of a different substance from the more or less cartilaginous stem. Fries even seems inclined to separate this and the two following subgenera from other agarics, under the name of *Chondropus*. Most of the species are small, but there are one or two which are very conspicuous. We have here four sections: 1st, those in which the stem is rather stout and sulcate, or fibrilloso-striate; 2ndly, species in which it is velvety, floccose, or pruinose; 3rdly, those which have a slender nearly equal fistulose stem, which is smooth, except at the base, and even; and 4thly, species with dusky gills.

One of the most common agarics in our woods is *A. radicatus*, which is remarkable not only for its deeply rooting stem, but also for its wrinkled, glutinous, but scarcely moist pileus. *A. platyphyllus* is one of our finest species, and easily known from its long, thick, white string-like roots; while *A. fusipes*, which grows in clusters at the foot of oaks, has the pileus frequently deeply cracked, and springing from a stem swollen in the middle, and it should seem, from the observations of Léveillé, throws up new individuals from the base of the old stem, as indeed is the case in the specimen figured (Fig. 5). This, though unfit for stewing from its tough consistence, is one of the best species for pickling. Under the second section we may notice *A. velutipes*, a species conspicuous for its bright colours and beautifully velvety stem, enduring a good deal of cold, and occurring upon almost every kind of timber. It is one of the commonest species, and must be known to almost every one. A host of smaller species occur, one or two of which are parasitic on some of the larger gill-bearing fungi, and are remarkable for forming dense cellular masses which live through the winter, and produce the perfect fruit in the following year.* One of these, *A. racemosus* (Fig. 6), is the most remarkable perhaps of all the Agaricus, as it not only produces a pileus, but a quantity of heads on the stem, which have quite a different structure, and have different spores. In the third section we meet again with a small though esculent species, *A. esculentus*, which, under the name of nagelschwämme, frequently appears in the markets of Germany. Of the fourth

* An account of some of these has already been given in a former volume of the INTELLECTUAL OBSERVER.

little need be said, as we have very few representatives, and those of little interest.

Omphalia, as the name (from ὀμφαλὸς, a navel) implies, is distinguished by its pileus being depressed, or umbilicate, from the earliest stage of growth, while in *Clitocybe* this form is only assumed at a later period. Most of the species are small, and the subgenus does not seem to contain a single species which is confessedly esculent. There are two principal groups, in the first of which the margin is incurved and involute, while the pileus is from the first dilated; in the second the pileus is at first campanulate, and the margin straight and pressed to the stem.

It is not easy to point out any very conspicuous examples, but I figure as an illustration *A. affricatus* (Fig. 7), found in Aberdeenshire in 1862, which, like some of the other species, grows on *Sphagnum* in wet places. *A. muralis*, as the name implies, often grows on the capping of stone walls, and is of a reddish brown colour; while *A. umbelliferus*, with its broad, triangular, very distant gills, assumes all sorts of colours, as grey, green, yellow, etc., and occurs in as great a variety of climates. The second division consists of small but often very pretty species, one of which, *A. campanella*, may be often found on fir cones, where it is remarkable for its abundant tawny mycelium.

Mycena, named from μύκης, a fungus, comprises a multitude of extremely pretty species, which are generally small, and sometimes almost minute, and is with difficulty distinguished from the second section of *Omphalia*, having like that the margin of the pileus straight and never involute. The pileus, moreover, is not as in that umbilicate; nor are the gills truly decurrent, though in a few instances there is a strongly developed decurrent tooth. The genus does not contain a single economical species; indeed, the small size renders them unimportant in this point of view, and some are probably poisonous, as indicated by the strong alkaline odour.

The sections are numerous. 1. We have the edge of the gills of a different colour from the hymenial surface—a circumstance which renders many of them extremely pretty. Several examples occur in our woods, of which, perhaps, the most common is *Agaricus elegans*, the gills of which have a yellow edge. 2. The next section includes species of pure tints, unmixed with grey or brown, in which the stem is dry, and the base not dilated. *A. purus*, which is remarkable for its strong scent, resembling that of radishes, may be found in every wood, where it attracts notice by its beautiful rosy or purplish tint. The milk-white *A. lacteus* often occurs in profusion on fir-leaves, looking at a distance like large snow flakes. 3. A

third section contains species with rigid juiceless stems, with gills which are at first white, and then change colour. They are inodorous, and often very difficult of determination. *A. galericulatus* is extremely common on trunks of trees, and assumes a variety of forms. A nearly allied species, *A. polygrammus*, which is far from uncommon, is known by the deep striæ of the shining stem, which run down for a great length. 4. The species of the fourth section differ from the last in being mostly strong scented, and having a brittle or soft, and not rigid, stem. *A. alcalinus* may be found everywhere, and the scent is very disagreeable. 5. In this section the stem is thread-shaped, and rather tough. The gills change colour, and are paler at the edge; like the species of No. 3, they are inodorous. One of the prettiest, which is not uncommon, *A. acicula*, is scarcely larger than a common pin, and has a scarlet pileus and bright yellow stem. 6. This section is distinguished by the gills and stem distilling a milky or coloured juice. *A. sanguinolentus* (Fig. 8), in which the juice is of a madder red, is a common example. In *A. galopus* the juice is white and milky, and there are some other native examples. 7. The species of this section have a viscid stem. *A. epipterygius* is common on dead fern and elsewhere, and is very pretty. *A. roridus*, which occasionally occurs on twigs of bramble, in wet weather, absolutely drips with mucus. *A. vulgaris* occurs sometimes in myriads in fir woods, but it is not common everywhere. 8. This is a pretty section, remarkable for the species having the base more or less dilated. Few things are prettier than the minute *A. pterigenus*, with its rosy pileus and broad distant gills. It adheres to dead fronds of fern, by long radiating strigose threads. 9. Finally, we have minute species which grow on leaves and twigs, in which the stem springs at once from the matrix without any dilated base, as if it were grafted. *A. corticola* is abundant everywhere on the bark of trees, drying up in hot weather, and reviving with the first shower. It assumes various tints.

There remains only in this division of the genus Agaricus the subgenus *Pleuropus*, which, like *Armillaria*, contains species which are not closely allied to each other. Some differ only from *Tricholomata* in growing on wood and having an excentric stem. Some have a distinct veil, as *A. dryinus* (Fig. 9), which is sometimes a very pretty species. These have more or less decurrent gills. Others have no veil, but a distinct excentric or somewhat lateral stem. Many of these are large and important species. *A. ulmarius* attains a great size on the trunks of elms, and with some others has the gills sinuated behind, exactly as in *Tricholoma*. *A. subpalmatus* is remarkable for its dry but gelatinous coat. *A. lignatilis* occurs abundantly

at Burnham Beeches, and, if Fries is correct, the esculent white-seeded species, *A. markii*, which occurs in cellars at Vienna, on wine casks and mouldering beams, is the same thing. Other species have the gills very decurrent. Of these, *A. ostreatus* is common on various trees, especially the laburnum, and is considered esculent, but it must be a very coarse, unpleasant food, and care must be taken not to confound it with *A. Euosmos*, a poisonous kind, known by its scent, like that of tarragon, and its pale pink spores. A fatal accident was nearly occurring to a schoolmaster in Suffolk from confounding the two species. Curious specimens of *A. ostreatus* sometimes occur in cellars, bearing multitudes of minute, imperfectly formed pilei, and packed into a large mass which looks like a caulitlower.

In a third section the stem entirely vanishes, or exists only in a very early stage of growth, and the surface of the pileus rests on the matrix instead of the gills. In some of these the cuticle consists of a thick gelatinous coat, or there is a similar stratum in the substance. The species are many of them interesting from their form, colour, and sculpture, and as exhibiting the most degraded type which can be assumed by the genus. In a few the substance of the pileus is a mere membrane, and almost the whole plant consists of gills. Fig. 10 represents *A. applicatus*, which is a good example of the section.

Most of the species of this subgenus grow on wood, a few only on the ground. *A. tremulus* sometimes occurs on decayed fungi. The species do not dry up in decay, but become putrescent, which distinguishes them from the genus *Panus*. Most of the large species appear to be esculent. *A. corticatus*, which has occurred at Belvoir, is one of the most beautiful of British Fungi. The figures are all more or less reduced.

DESCRIPTION OF PLATE.

Fungi (*white-spored mushrooms, ringless or excentric*).

1.—Agaricus colossus.
2.—A. gambosus.
3.—A. carneus.
4.—A. geotropus.
5.—A. fusipes.
6.—Agaricus racemosus.
7.—A. affricatus.
8.—A. sanguinolentus.
9.—A. dryinus.
10.—A. applicatus.

OBJECTS VIEWED THROUGH THE CORNEA OF THE INSECT EYE.

BY THOMAS PRINCE.

MICROSCOPISTS are aware of the usual method of proving that the compound cornea of the eyes of insects are composed of numerous lenses, merely by placing beneath the stage, and behind the mounted cornea, any strongly defined object, a candle, a knife point, etc. A really interesting and beautiful arrangement, adapted for a *soirée* or public exhibition, may be made as follows :—

a, Fig. 1, represents the lamp flame; *b*, a three-inch bull's-eye condenser, so placed in relation to the lamp as to

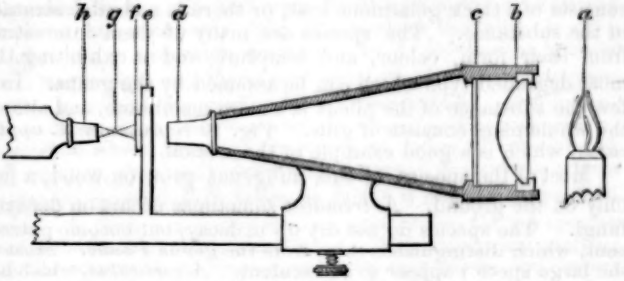


FIG. 1.

produce parallel rays; *c*, a photograph on glass, known as a "transparent positive," this in my case represents a portrait of Shakspeare—it is three inches diameter, and placed near the bull's-eye; *d*, an achromatic condenser; *e*, stage of microscope, distant about ten inches from *c*, the photograph; *f*, an ordinary slide of the cornea of an insect's eye, known among microscopists as one "mounted to show the image"; *g*, shows the point where the image is formed, a little in front of the cornea; as the picture will not be seen when the facets of the eye are in focus; *h* represents a quarter-inch objective, supposed to be in its ordinary position in the body of the microscope.

In adjusting the focus to find the image, it is desirable to work the rackworks of the body and the condenser at the same time, as the slightest movement of one affects the focus of the other. The apparatus described above, if carefully centred with the body of the instrument, will produce a novel and pleasing result, showing as many distinct portraits as there

are facets within the range of the objective. The same result may be produced by placing the microscope in an horizontal position, with the picture, etc., in their relative places, supporting the photograph on a temporary stand; but a slight difficulty occurs, in accurately centering the light, the bull's-eye, and the picture, so as to be in exact coincidence with the axis of the achromatic condenser. This may be got over by enclosing the whole by a tube temporarily fixed to the lower bar of the instrument, as shown in the diagram. By this plan, the whole may be at any time adjusted in a few minutes with the greatest ease and certainty. Fig. 2 represents a portion of the view as obtained by the above means. The uniformity of the portraits show these minute lenses to be of most astonishing accuracy and equality of form. And our admiration is excited at their delicacy of construction when we recollect that the picture is reduced by this minute marvel of design from one inch to the $\frac{1}{100}$ of an inch in diameter, or, in other words, it is reduced in size 2100 times, occupying a surface so small as to require 490,000 to cover one square inch.

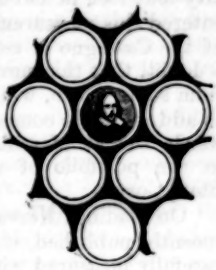


Fig. 2.

VISIT TO MOUNT ETNA—AGE OF A CHESTNUT TREE.

BY CAPT. R. SMITH, LATE H.M. 44TH REGIMENT.

In June, 1811, being employed on the Quartermaster-General's staff in Sicily, and engaged in making surveys of various localities, I visited Mount Etna, and of course did not neglect to examine that vegetable wonder, the Castagno di cento Cavalli, which seemed to me, as it had done to other travellers, not what was expected—a single tree, but apparently a cluster of five distinct trees, since reduced, I understand, to three. A late traveller has remarked, and I think with good reason, that a large tree may have existed on the spot, and that on its destruction in some of the many convulsions that have so often shook Etna to its very centre, the present cluster of trees sprang from its root.

But it is not of the Castagno di cento Cavalli that I am about to speak, it is of a more wonderful production of nature

in my opinion, which stands within a few hundred yards of that celebrated tree; it is the Castagno la Nave, a noble patriarch of the forest. This tree rises in an unbroken stem for about forty feet, then divides and throws out lateral branches to an enormous extent. It appeared to me, as I viewed it, to be comparatively a young tree, from the vigour of its growth and absence of decayed branches. I was accompanied by a friend, and after contemplating with admiration this splendid specimen of the vegetable kingdom, we proceeded to measure it with a surveying tape, and at four feet from the ground it measured fifty-four feet in circumference. I need scarcely add that I entered this measurement in my note-book. I took a drawing of the Castagno di cento Cavalli, which shows almost beyond a doubt, that this never was a single trunk, but a group; but from some cause, which I do not now remember, I neglected to add its noble companion to my other sketches; but I afterwards saw at Messina a very beautiful drawing of this tree, in the portfolio of my friend Lieut. Wright, of the Royal Staff Corps.

On reading *Murray's Handbook of Sicily*, which has been recently published, it is there stated that this very tree was carefully measured within the last year, and was found to be fifty-seven feet in circumference at three feet from the ground, nearly at the same height that I measured it, thus showing an increase in girth of three feet in fifty-three years. If, therefore, we take for granted that the growth was the same every fifty-three years, the calculation makes the tree now 1007 years old; the following formula will show it more clearly:—

If 3 ft. 53 years 57 ft.

53

171

285

3)3021

1007 years.

But if we presume that the tree increased in bulk somewhat more than three feet in fifty-three years in the early period of its growth, which by the by does not appear to be generally the case, for I have examined the annual rings in the trunks of many newly cut down trees, and found them on an average of equal thickness throughout, except towards the south or sunny-side, where they are generally thicker, on the same principle that plants grown in a window will always increase more

towards the light. But even allowing this, it would still make the tree nearly 1000 years old, no contemptible age; and although it is now showing symptoms of decay, for it is said to be partly hollow, yet it is not impossible but what it may, if the lavas of Etna spare it as they have hitherto done, live some five or six centuries more.

It is stated in the *Handbook* that there is another chestnut tree, a little further up the mountain, seventy-six feet in circumference, but this I did not see, nor did the guide mention it, and in those days handbooks were not as plentiful as they are now. I therefore missed it, and indeed might probably have missed also seeing the Castagno la Nave, if my attention had not been directed to it before I left Messina, for the guides are so taken up with the Castagno di cento Cavalli that they can think of nothing else.

I may mention that I also measured an oak tree a little lower down the mountain, and found it forty-six feet in girth; but it was much decayed in the branches, and probably considerably older than the Castagno la Nave.

How these trees have escaped for so long a period the devastating streams of lava and irruptions of fiery cinders that have within that period destroyed innumerable towns and villages, exterminated hundred of miles of vineyards and olive groves, and buried thousands of human beings, is indeed a wonder and almost a miracle.

ART SUBJECTS AND THEIR TREATMENT.

The Exhibition of Pictures at the Royal Academy for the year 1865 possesses, on the whole, a very considerable amount of merit, but we cannot say that it leaves the mind of an "intellectual observer" quite satisfied with the indications it affords of the state of education, thought, and feeling in the artist-world; although the choice of subjects is as varied as might be expected in a collection of more than a thousand works, produced at a time when no special books or circumstances exercised a dominant influence over picture-makers or picture-buyers.

The absence of works adapted to public buildings is the natural result of there being no demand for them. Our cities and towns are not yet civilized enough to devote any portion of their wealth to the gradual accumulation of works of art, and the tastes and requirements of a few thousand wealthy members of the middle class chiefly determine the nature of

the demand which the painter has to supply. The aristocracy are, as we are informed, not in these days buyers of pictures to anything like the extent of the merchants and manufacturers, whose splendid fortunes form so conspicuous a feature in our social system. This will help to account for the decline of pictures on classical subjects, which the one-sided education of the upper classes kept in vogue long after the period of their natural death had arrived. This remark must in nowise be understood as depreciating the grand merits of classical literature; but the poetic thoughts of modern times seldom take the forms of dead mythology, and it is surprising how little of the spirit of Greek or Roman history is communicated to the recipients of what is called "classical education" in old-fashioned schools. We are not surprised, therefore, that classical subjects present no important feature on the Royal Academy walls; and in examining what they do offer to our contemplation, let us first consider what Biblical subjects have done for our artists, and what the artists have done for them in return.

Looking through the catalogue, we find that Esau suggests the subject of one picture; "Jesus Christ, with the Disciples, on the way to Emmaus;" "The young Saviour observing the Hypocrites;" the miraculous restoration to life of the young damsel, whose story is recorded in the fifth chapter of Mark; "Esther's Banquet;" "Esther dressed in her royal apparel;" "The Devil Sowing Tares;" and "Elijah's Sacrifice;" a very unsatisfactory David, and a pair of extraordinary angels, forming the themes upon which, after divers fashions, other artists have pictorially discoursed. The two most remarkable of these pictures are by Millais, to whom belong "The Sowing of the Tares," and "Esther in her Royal Robes." The treatment of the first subject is a mixture of the literal and the grotesquely allegorical. An ugly, unpleasant-looking old man is engaged in scattering seeds on a curious looking soil, and beneath a coarsely-executed and impossible sky, which lights him up with a flowing dab of yellow paint, in strong contrast with some clouds that look like the leaden pigment with which house-painters often commence their work. The agricultural process in which the sinister-looking old gentleman is occupied appears to give satisfaction to a couple of snakes, whose slimy presence is presumed to assist in the allegorical meaning of the scene, and he is followed by a zoological curiosity, between a dog and a hyena, with a shambling gait and phosphorescent eyes. Some centuries ago, when the Father of Evil was popularly recognized in the delineations of mediæval legends, the parable of the tares might have presented itself to common imaginations in some such guise; but who is there in these days who

will be assisted by Mr. Millais' queer, quaint, and powerful caricature to form a higher or a deeper conception of the moral truth embodied in the narrative, than he would have done from simply reading it or hearing it read?

We are not impressed with the "Scenes from the Life of Christ" that stand next in our list. After all that has been done, it is, no doubt, amazingly difficult for any one to satisfy us with delineations of these subjects. Novelty in conception, dignity, and poetic truth in their treatment, are characteristics we want and seldom find.

Queen Esther is the theme of two pictures; one by Mr. Armitage represents the "Banquet of Wine," at which Haman makes supplication for his life. The treatment of this story does not convey the impression that Mr. Armitage was very deeply moved by it. It looks as if he regarded it as affording opportunity for depicting a richly-draped oriental group, and we look at it without any moral or intellectual excitation being the result. Out of the thousands who will look at it on the Academy walls, perhaps none will find that it has induced them to refer to the Scripture narrative on their return home. The second picture is by Millais, who brings before us a brilliant yellow silk dress, ornamented with rich and curious embroidery. The fashion may not be quite that of high life in Pekin, but it has a Chinese aspect, and had we seen it at the Crystal Palace, it would have seemed an appropriate companion of the rich and rare things from the Summer Palace of the "Central Flowery Land." But the features of the inhabitant of this gorgeous robe are not Chinese, so no such mistake ought to be made. True, after looking at the dress, you can see the lady, who is the accessory in the scene —the principal being undoubtedly the dress itself. Now, it will happen, even in the best society, that the tailor makes the man, and the dressmaker the woman; but our own—unartistic —recollection of the old story is that Queen Esther was of a different stamp, and we ask in an ideal portrait the charm of womanhood that subdued the savage monarch, and some evidence of the patriotic devotion that made her the benefactress of her race. Yellow silk, with the best embroidery, did not do the work the narrative ascribes to her, and we should not have associated the picture with any Jewish heroine at all. It is a wonderful portrait of a yellow dress, and nothing more.

The grandest of the Scripture subjects treated in the exhibition is "Elijah's Sacrifice," by Mr. A. Moore. We cannot in the least comprehend the theory he has formed of this scene. In Mendelssohn's sound painting it is sublime. The barbaric rites of the idolaters, the fervid piety and stern

enthusiasm of the Jews, are facts recalled from the past, and made parts of our actual and vital present in the strains of the Oratorio, but the artist only puzzles our eyes with ineffective grouping and monotonous tints.

Biblical subjects, then, are a failure in this exhibition. It ought not to be so, because they have the immense advantage of being known to all, and in their poetical ideal aspects are perfectly independent of the critical discussions that agitate and perplex our times.

Let us next look at the historical and political subjects upon which our artists' pencils have been engaged. Latest in the date of the scene, and foremost in attracting attention, is Mr. Frith's representation of the "Marriage of the Prince of Wales." The artist did not exercise any choice in the selection of this theme, and with all his skill he has only been able to add to previous proofs of the fact, that Court ceremonials, however interesting to spectators, have little to commend them to the artistic mind. With regard to other historical pictures, we may presume that their subjects were selected because they possessed some qualities of incident or suggestion which the painter desired. The list of pictures of this class is not long, and the mere recital of the titles suggests some curious thoughts. Lucknow and Cawnpore furnish Mr. Jones with themes from the Indian mutiny, which he proposes to work out on a larger scale. "The Battle of Edgehill," selecting the moment when Prince Rupert, aided by the desertion of Sir Faithful Fortescue from the Parliamentary ranks, makes a successful charge, supplies a text for Mr. Cooper. Mr. Wynfield represents the "Last Days of Elizabeth" when she was "mopish and melancholy"; Mr. Millais has a "Joan of Arc"; Mr. Ward tries the old story of "Rizzio's Murder," taking the time when Ruthven enters the little chamber at Holyrood, and says to the Queen, "Let your man come forth—he has been here too long."

Mr. Millais, in addition to the "Joan of Arc," gives us an ideal scene of the Romans leaving Britain. Mr. O'Neile depicts, after a fashion, the pretty incident of Canute stopping his boat to hear the monks of Ely sing. Mr. Storey exhibits Henry VIII. taking his part in public games; Mr. Clay shows Charles IX. surrounded by his courtiers, and instigated by Catherine de Medici to join in the massacre of the Protestants by firing at them out of the window; Mr. Lacy represents Garibaldi depositing a wreath on the tomb of Ugo Foscolo, at Chiswick. Mr. Prinsep takes his subject from the flight of Jane Shore; Madame Jerichau has a simple, pathetic picture of a wounded Dane attended by his betrothed; Mr. W. J. Grant portrays Marie Antoinette endeavouring to win one of the opposition

leaders by showing him her child asleep; Mr. Drummond gives an incident in the life of Claverhouse; Mr. Hayllar is inspired with "Queen Elizabeth's toothache;" Mr. Faed takes an incident from old border minstrelsy, and his picture—a very good one—is historical in spirit, if not in fact; Mr. Leslie discourses in pigments on the "Defence of Latham House."

Not one of these subjects indicate any particular research amongst recent writings on the part of the artists. Their pictures might have been painted at any time, from information picked up anyhow, and no one has any special tendency to stir up great thoughts, vindicate noble memories, or incite to lofty deeds. Within the last few years, a very powerful, and in many cases, novel light, has been thrown upon English and continental history by the labours of Froude, Mottley, Kirke, etc. Mottley's *Rise of the Dutch Republic* and *History of the Netherlands* are grand works, exciting to read, and abounding in vivid descriptions of scenes, not hackneyed, and full of human interest. Do our artists peruse none of these things? If the historical pictures of the present exhibition were all put together, who would be better for them, morally or intellectually? The two most striking pictures are "The Night of Rizzio's Murder," and "The Romans leaving Britain." In the former case the worthlessness of the victim, the dubious character of the Queen, the undoubted baseness of her husband, and the brutality of Ruthven, are not the elements out of which a picture intellectually or morally great could be made. The story is melodramatic rather than genuinely tragic, and it has long since become commonplace. Passing over the want of high purpose in this picture, we do not think it merits much praise upon æsthetic grounds. The lurid fire-light overpowering the numerous candles on the table is scarcely natural, and certainly not beautiful. The spectral-looking Ruthven conforms pretty closely with the story, as it has come down to us. Darnley looks mean enough for those who take the worst view of his wretched character; and Mary shows a mixture of disgust with her husband, anger at the intrusion, and alarm at its aspect, which is highly probable.

But why represent these things on canvas? As a domestic picture it is disagreeable, not redeemed by any pleasant harmonies of colour. It makes us feel that a supper party of loose people, intruded upon by a ruffian proposing to kill one of them, is a very unpleasant affair. Beyond this we find nothing to recompense the horror which an incipient murder excites.

Mr. Millais, in his work, has given us a very powerful, if not very pleasing, delineation of human feeling. A Roman soldier casts himself in a last embrace upon a British woman,

whom he has to leave behind, and her countenance is full of sternly-suppressed emotion of the bitterest kind. The scene is on the coast of Kent, the chalk cliffs stretch along the shore, and they are painted neither according to nature, nor after the pre-Raphaelite style of exaggerating detail. The grass is little like grass, the chalk little like chalk; but there is power in the figures and faces, so that with little of the beauty that ought to belong to a work of art to attract the eye, the visitor to the gallery is, nevertheless, a captive for the time, and what the artist has painted remains fixed upon the memory, even to the oyster-shell in the corner, that indicates the last Roman meal.

Next to historical subjects, biographical ones are most naturally considered, and the foremost of the few pictures belonging to this class is "The Early Career of Murillo," by J. Phillip, R.A. In the youthful days of the great Spanish artist, poverty compelled him to paint hasty pictures for sale at the weekly fair, "held in a broad street branching from the northern end of the old Alameda. This venerable market presents every Thursday an aspect which has changed but little since the days of Murillo. Fruit, vegetables, and coarse pottery, old clothes, old iron, still cover the ground as they did two centuries ago, when the unknown youth stood among gipsies, muleteers, and mendicant friars, selling for a few reals those productions of his early pencil for which royal collectors are ever ready to contend." No one can say that this is not a good subject for a picture. It stands out pictorially in the extract from *Stirling's Annals of Spanish Painters*, which we have given from the Academy catalogue. Human sympathy strongly attaches itself to the early struggles of the world's great men; and Mr. Phillip shows us, in the fine face and proud aspiration of the young artist, a promise of future fame, which seems also to impress itself on the rough picturesque critics who are laying down the law, as they contemplate a little piece which Murillo offers for sale. The grouping and accessories of this fine work are eminently picturesque; but there is a want of harmony amongst the various hues and shades of reds and greens in the middle and on the left of the work, which it would be well to correct.

Comparatively few pictures have been suggested by the writings of our poets, either ancient or modern. There is, of course, an Elaine, and there are two Mariana's from Tennyson's well-known lay. Southey's *Battle of Blenheim*, with its refrain, "'Twas a glorious victory," suggests another work. Lord Derby's *Homer* has caused Mr. Leighton to give us a Helen, whom we cannot fancy the Greeks would have been so unwise as to seek to regain through many a bitter fight and a

protracted siege. Milton's *Penseroso* gives a title to one piece, and Tennyson's lines—

> "O swallow flying from the golden woods,
> Fly to her, and pipe, and woo her, and make her mine,
> And tell her—tell her—that I follow thee,"

have caused Millais to paint one of the most truthful and beautiful things he has yet achieved. A young girl in a black dress, with a blue bodice, looks and listens eagerly to a swallow who brings her lover's message from the "golden woods." For a pleasant wonder Mr. Millais did not choose an ugly model for his lady, and the antique furniture of the room, with the lights glinting on the carved and polished chair—all are in exquisite taste. One or two Shakspeare pieces we did not think successful. Browning—whose works are rich in themes for true artists—has not received a single illustration; but Mrs. Browning, whose writings would well repay any artist's study, has found in Mrs. F. L. Bridell an elegant interpreter for her pretty story of the "Romance of the Swan's Nest." "Little Ellie" is sitting musing on her discovery, and indulging in childhood's romantic dreams.

Thus our artists seem to have got as little from the poets as they did from the historians. Let us now survey their labours from another point of view.

Scenes of oriental life are conspicuous in this exhibition, and in the first rank of these is a work which, for many rare qualities, is the finest in the whole collection. That we mean Mr. Goodall's "Rising of the Nile" will be obvious to all readers who have seen the pictures of this year. When the fertilizing floods of the Egyptian river exceed, by a few feet, their average rise, many villages are submerged, and desolation and ruin await their surviving inhabitants. Mr. Goodall represents the waters reaching such a village, and a family making its escape. An old man with a green turban, seated on a refractory camel, urges the affrighted beast to make the last effort by which safety will be gained. A dark-skinned servant gives his aid. In front is a little girl in a loose pearl-yellow robe, with a green sheen upon it; she holds a lamb in her arms. Near her is a woman carrying a baby; her outer garment is of a rich and varied purple hue, the under one of a singularly fine deep tone of crimson, mostly in shadow, but flashing like a gem where its silken tassels catch the light. An old, bedridden man is carried by picturesque figures, and several other characters fill up the scene. This splendid work is remarkable for several peculiarities. The time is early morning, and the humid sky diffuses a cold, clear light, differing widely from the gorgeous, sunset hues for which

Egypt is famous, and which we lately endeavoured to portray. All the figures are in comparative shadow with the bright light behind the entire group. Such a treatment offers picturesque advantages at the expense of great difficulties, which latter are admirably surmounted. Under such circumstances, richness of effect and brilliancy must depend entirely on the skill with which the colours are contrasted and harmonized. Only one little touch of white is introduced, and a magical use is made of greens, purples, crimsons, blues, and yellows. Those who fancy that the colourist has nothing to do but bring strikingly opposed tints into juxtaposition, should study the immense variety of tones and hues that are introduced into the draperies of this piece. The dress, that at first sight would be pronounced blue, is in reality of very complicated and varied hue, and no part of the drapery is wanting in elaboration of colour harmony. It is this, quite as much as the splendid drawing, that makes the "Rising of the Nile" a truly great work—to our mind far exceeding anything Mr. Goodall has hitherto accomplished. We do not wish to make unfair comparisons; but let any one who has an eye for colour, go from this picture to the fine painting representing Murillo's boyhood, and he will then see how great an advantage the "Rising of the Nile" possesses over the other important work, because more pains have been taken to fill up the scale of colour, and give that harmonious completeness which affords a permanent sensation of delight.

Another striking oriental picture, but of a much lower grade than the "Rising of the Nile," is the "Turkish School at Cairo," by J. F. Lewis, R.A. elect. The colouring is brilliant, but scarcely harmonious, and the human interest is secondary—the draperies and accessories constituting the artist's real theme.

Domestic scenes in various ranks of life supply subjects for far too many pieces for us to enumerate. In dealing with cottage life, our artists, with scarcely an exception, commit the common fault of treating their inmates as objects to be done into paint, not as persons having joys, sorrows, temptations, and triumphs like themselves. The boards and tiles, the pots and pans may be unexceptionable, but the sentiment is wanting. We might, however, mention several delineations of domestic life that are pleasing and meritorious as far as they go; one of the prettiest in conception is the "Old Maid"—two young girls, dressed in old style, are playing at cards the game of "Old Maid," and the loser exclaims, "Maggie, you're cheating." Mr. Archer is the artist from whom this clever picture comes. Webster's "My Back Kitchen" is admirable for its truthfulness to fact and to a conception void of the poetic, and if we may name Sir

E. Landseer's "Connoisseurs" in this series, it would be placed at their head. The artist is making a sketch, and two dogs, looking over his shoulders, are criticising the work, evidently with more intelligence than human connoisseurs often display.

Landscapes form the last great category to which we shall allude; and among the most elegant and pleasing is "The Village Smithy," by Creswick, who has in this instance managed to forget the mannerism which so sadly detracts from the average merit of his works. A landscape ought to be beautiful or it is not worth painting, and it ought especially to exhibit those charms of light and colour which are evanescent in their effects, which the true artist should be the first to recognize, and which he only has the power to retain. Instead of contenting himself with somewhat tame green trees, over-polished rocks, and soapy streams, Mr. Creswick has this year given us a beautiful effect of contrasted light. A cool evening sky, with a crescent moon, graceful trees, and a flowing river, contrast exquisitely with the red light from the village smithy. The delineation is at once natural and poetic. All of us may have seen something of the kind, and fancy clings fondly to such pleasantly-tinted recollections. We should all like this picture, and are half-vexed that, with so many other good things, "private property" should swallow it up. The thought makes us exclaim with Proudhon, *La propriètè c'est le vol.* The Linnells are of course in the landscape series; and the "Shepherd's Mount," by W. Linnell, is very fine. What we regret with them, and many other artists, is that they stereotype a manner. You see fiery skies of a particular red tint, corn of golden brown hue, and blue distances in certain combination, and you are sure it is a Linnell—father or sons. Nature cannot look so much alike to this clever family. She is infinitely varied; why cannot they avoid travelling on one path till they have made a rut?

We know not under what head to place the very mannered and very popular productions of Mr. Hook. In the true artistic sense of the term they are not landscapes, but *Hookscapes*. He forms a theory of the sort of rock and water that will go with his brown faced men and boys. It is not like nature, nor is it an artist's bettering of that which he sees. Clever it undoubtedly is—sell it undoubtedly does; but it has grave faults in the eyes of those who love the actual as seen in an ideal light.

We have brought our examination to a conclusion. We have made no attempt to note all the pictures in the several series that might deserve comment. Our object has been to arrive at some notion of the state of the artist-mind, from its choice and treatment of subjects for pictorial work. We find, as all honest critics must do, much to praise and be proud of, but

we think we are not wrong in affirming that a want of literary culture is on the whole noticeable and regrettable. It is manifested in the little that our artists seem to learn from our poets and our historians, in the poor view they so often take of life and its realities, and in the tendency evinced in so many landscapes to avoid rather than to seek a comprehension of the varied effects which nature produces and exhibits, and to take refuge in a mannerism as soon as any particular mode of treatment has been discovered that conduces to immediate gain. The artist ought to be one of the highest of the people's teachers. When more artists take their true position, an analysis of the subjects of a thousand pictures will give a very different result.

DR. DRAPER'S TELESCOPE.

BY THE REV. T. W. WEBB, A.M., F.R.A.S.

It is gratifying to observe that, amidst all the calamities and distresses and confusion of a most unhappy civil war, the studies of peace have not been wholly lost to sight. A remarkable instance of this is afforded by the recent appearance, among the publications of the American Smithsonian Institution, of a very interesting and valuable memoir, "On the Construction of a Silvered Glass Telescope, 15¼ inches in aperture, and its use in celestial photography, by Henry Draper, M.D., Professor of Natural Science in the University of New York." A copy of this, through the courtesy of the author, being now in my hands, I have thought that some account of its contents might prove interesting, especially at a time when silvered glass specula are attracting some attention in England, and (unless we are much mistaken) are likely to be more generally known and valued as most important aids to the progress of observation.

The opening sentence of this memoir requires, however, we venture to think, a little qualification. "The construction of a reflecting telescope capable of showing every celestial object now known," Dr. Draper tells us, "is not a very difficult task." We should have no hesitation in expunging the negative here, unless it were permitted to add, "when study, and labour, and ingenuity, and perseverance have been brought to bear upon it, equal to those displayed by Dr. Draper." His subsequent remark is of more universal application. "The cost of materials is but trifling compared with the result

obtained; and I can see no reason why silvered glass instruments should not come into general use among amateurs. The future hopes of astronomy lie in the multitude of observers, and in the concentration of the action of many minds." His first idea was derived from an examination, in 1857, of Lord Rosse's great reflector, and of the machinery by which it was perfected; and on his return home in the following year, he resolved to construct a similar, though smaller instrument, larger, however, than any in America, and adapted to celestial photography. A metal speculum was first completed, but was split in two during the winter of 1860 by the expansion of a few drops of water that became frozen in the supporting case, and his attention was then, at Sir John Herschel's suggestion, turned to silvered glass mirrors, as reflecting more than 90 per cent. of incident light, with only $\frac{1}{8}$th of the weight of metal. The year 1861 was occupied in overcoming the difficulties of grinding and polishing three 15½-inch discs of glass, as well as a variety of smaller pieces. Three similar mirrors were found almost essential, as two would often be so much alike that a third was necessary to gain a further step in advance. One was made to acquire a parabolic figure (see INTELLECTUAL OBSERVER, iii. 213), and bore a power of 1000. The winter was spent in perfecting the art of silvering, and studying photographic processes. A large portion of 1862 was spent with a regiment in a campaign in Virginia, but in the autumn sand-clocks and clepsydras of various kinds were made, and the driving mechanism attained great excellence. During the winter the art of communicating the parabolic figure by Foucault's method was acquired, and two 15½-inch mirrors, and two of 9 inches, for enlarging photographs, were completed. The greater part of 1863 was spent in lunar and planetary photography, and the enlargement of negatives, some of which were magnified to three feet in diameter. Two specula of 15½ inches were also completed, ground to an oblique focus for front view. "This work," he adds—and any one with very little experience may judge of the immense amount of toil involved—"has all been accomplished in the intervals of professional labour." Many of the expedients adopted in the working, which are detailed at full length, are strikingly characteristic of ingenuity as well as perseverance. To avoid the tediousness of grinding out defects in a metal surface, they were "stopped out," after the manner of engravers, and the uncovered space corroded away by the action of nitro-hydrochloric acid; by a similar mode, the strength of the acid being graduated in separate zones towards the edge, an increase of 15 inches in focal length was gained. The grinder and mirror were at another time included in a voltaic circuit to abridge

the grinding process, and an idea was entertained of saving much weight by electrotyping a brass mirror with speculum metal. When he commenced operations with glass, he had to polish with his own hands more than 100 mirrors of various sizes, from 19 inches to ¼ inch, and to experience very frequent failures for three years before he was able to produce large surfaces certainly and speedily. His labour would have been much diminished, inasmuch as he would have been spared the causeless condemnation of many fine mirrors, as well as the working of some *square* ones, had he become earlier aware of an important fact respecting the rigidity of the material.* Generally speaking, a sheet of glass, even when very thick, can hardly be set on edge without so much flexure as to render it optically worthless; but fortunately, in every disc that he tried, there was one diameter on either end of which it might stand without harm. On turning a disc of 15½ inches, with a thickness of 1¼ inch, one quarter round, it could hardly be realized that the surface was the same: 90° more restored it to its original defining power; and this effect was found to be independent of any irregularity on the edge of the disc and of the mode of support. Dr. Draper refers it with great probability to the structure of the glass, resulting from its having been subjected to rolling pressure. A similar irregularity of structure is known to obtain in many large object-glasses, and Dr. Draper specifies the great achromatic by Cauchoix, presented by the late Duke of Northumberland to the University of Cambridge, as having had its lenses turned round by Mr. Airy in mounting, for this reason. Short's Gregorian specula, too, were always marked on the same account. The strange deformations of image produced by heat, even by the warmth of the hand for a few seconds, are described and represented. From such distortions the speculum would not recover in ten minutes, and the error would be rendered permanent by repolishing in that condition; and so injurious may such causes, even in a lesser degree, prove during the delicate process of the final correction of the spherical error, that "a current of cold or warm air, a gleam of sunlight, the close approach of some person, an unguarded touch, the application of cold water injudiciously, will ruin the labour of days." He found it a matter of not unfrequent occurrence that a speculum would perform much better with rays of a certain amount of obliquity,† deviating from 2° to 3° from the axis. It is obvious

* In examining and testing last year some fine 8-inch specula of Mr. With's workmanship, I had independently ascertained this peculiarity, so far as a *best position* for each was concerned, but I stopped short of Dr. Draper's discovery o a regular *axis of rigidity*.

† I became acquainted with this fact many years ago, when working metals for a small Newtonian reflector.

that if this peculiar form could be produced at will, and to an adequate degree, it would render the Lemairean, or front view telescope, perfect. Dr. D., however, found that the image was never quite as fine as in the usual kind of mirrors. A letter of Maskelyne subsequently came under his notice, in which he describes a very great improvement effected in a 6-foot reflector by Short, by inclining the large speculum $2\frac{1}{2}°$, and remarks very reasonably that "probably it will be found that this circumstance is by no means peculiar to this telescope;" a hint which may be worthy of the consideration of the possessors of reflectors. Such surfaces require to be reground, or "re-fined," *i.e.*, finished with the finest emery, to get rid of this obliquity, as repolishing, though occasionally successful in a few minutes, will not always effect it; the attempt failed in one instance though continued for $13\frac{1}{2}$ hours.

The modes of forming the requisite tools, of preparing emery, of grinding, polishing, testing (by Foucault's mode), and silvering the surface, are somewhat too technical to find a place here, but some interesting facts are worthy of being referred to. Such is the effect produced by the removal from a cast-iron tool, $15\frac{1}{2}$ inches in diameter, divided into $\frac{3}{4}$ inch squares, like a chessboard, of every alternate square by an acid. Though the corrosion extended only to a very slight depth, it flattened the curvature of the tool $7\frac{1}{2}$ inches. "This shows what a state of tension and compression there must be in such a mass, when the removal of a film of metal, $\frac{1}{50}$th of an inch thick, here and there, from one surface, causes so great a change." Another important remark is, how injurious an atmospheric disturbance is set up by the intermixture of currents of warm air from the observer's person with the rays falling on or reflected from the mirror—an observation which I made many years ago, and which any one may test by directing a Newtonian to any bright object, and placing one hand beneath the aperture, while an eye-piece held in the other hand, and applied to the eye, is carried back a considerable distance, so as to obtain a very long focus, and render the ascending currents more visible. It has not, I believe, been generally remarked how prejudicial an effect this must have on definition in the front-view reflector, and it would be a worthy object of attention to remove the evil by the interposition of some non-conducting shield.

A full trial was given to no less than seven machines, on the principles employed by Lord Rosse and Lassell, with modifications of his own. The prime mover, called the "foot-power," was a very ingenious contrivance, in which very little force is lost in overcoming friction, and which is frequently employed in America for dairy use. Dr. D. himself

generally walked in his own, and has travelled some days, during five hours, more than ten miles. It consists of an endless band of short transverse boards or "treads," interlocking so as to form a platform to tread upon, which will not yield downwards on its upper side, but hangs loose in the return half beneath, and passing over wheels and rollers at either end. This succession of boards, having one end a little higher than the other, runs downwards as soon as a weight is placed upon it, and communicates motion to a large wheel on the axle of the one over which it turns, and through it to any connected machinery. Being placed between a handrail on either side, it offers the appearance of a little narrow bridge, as over a ditch, composed of transverse boards, on which the mover may walk all day without getting a step forward. It is, in fact, a species of treadmill, of a much more pleasant construction.

The mode of giving a parabolic figure finally preferred by Dr. D., is that of "local retouches," in which the edge of a spherical mirror is flattened, or, which he thinks preferable, the centre is bored out deeper, by appropriate polishers of curvatures differing slightly from that of the original tool on which it was wrought. This method, as invented by M. Léon Foucault, at Paris, was employed by hand, but has been practised by Dr. D. with suitable machinery, and with excellent results; his great specula, thus finished, bearing a power of 1200, and dividing the celebrated test-pair γ^2 *Andromedæ*; while so great is the light-collecting power of 15¼ inches, that the companion of *Vega* can be perceived even with the unsilvered surface; some portions of the moon are even more visible than after silvering—a hint worth notice. When silvered, the quantity of lunar light is so overpowering as to impair for a long time the vision of an eye placed at the focus. Several modes of silvering were tried by Dr. D.—some devised by himself. Foucault's proved uncertain in its results; that of Cimeg, with tartrate of potash and soda, for looking-glasses, modified so as to fit the silver for being polished on the reverse side, he found superior to any, and in using it, "never on any occasion failed to secure bright, hard, and in every respect perfect films." Their thickness is about $\frac{1}{200,000}$ of an inch—nearly the same with that of gold-leaf of equal transparency—the sun appearing through the silver of a light blue tint. Variations in its thickness are consequently only small fractions of that fraction, and of no optical moment whatever. It tarnishes quickly if exposed to sulphuretted hydrogen—a defect which has been avoided in the English process—and it may be split up into fissures by damp; but heat does not affect it, and it is generally very enduring. "I have

some," the doctor says, "which have been used as diagonal reflectors in the Newtonian, and have been exposed during a large part of the day to the heat of the sun concentrated by the 15¼ inch mirror. These small mirrors are never covered, and yet the one now in the telescope has been there a year, and has had the dusty film, like that which accumulates on glass, polished off it a dozen times."

Besides other interesting optical particulars, the memoir contains many directions for the successful practice of celestial photography, some of which might be found equally valuable for terrestrial purposes; and to these we may advert on a future occasion; adopting for the present the author's closing remarks: "In concluding this account of a Silvered Glass Telescope, I may answer an inquiry which, doubtless, will be made by many of my readers, whether this kind of reflector can ever rival in size and efficiency such great metallic specula as those of Sir W. Herschel, the Earl of Rosse, and Mr. Lassell? My experience in the matter, strengthened by the recent successful attempt of M. Foucault to figure such a surface more than thirty inches in diameter, assures me that not only can the four and six feet telescopes of those astronomers be equalled, but even excelled. It is merely an affair of expense and patience. I hope that the minute details I have given in this paper may lead some one to make the effort."

HYSTERO-DEMONOPATHY IN SAVOY.

THE term *Hystero-demonopathy* has been invented by medical writers to designate a form of hysteria in which the patients conceive themselves subjects of demoniacal possession. For the spread of disorders of this class it is necessary that the victims of the malady should be ignorant persons, or, at any rate, not having received any practical scientific training; that the locality should be more or less isolated from the busy world and that sharpening of the intellect and firmness of moral character which results from the healthy exercise of faculties under civilized conditions; and lastly, that there should be a general belief in particular forms of superstition favourable to the delusions of those whom the disease attacks. Cases of this kind are very interesting in a scientific point of view. There must be a certain *substratum* of positive physical disorder, and there must be a mental disorder co-operating with the former, exaggerating its violence, and giving it a special direction. During the middle ages such epidemics were common, and they are probably much more frequent now than is generally supposed; but the difference is, that whereas in former times of greater ignorance, less security for life and property, and less regular industry, they made their appearance in important localities, they are now chiefly confined to districts that have escaped the progressive influences of our time, and it is only by accident that any person of adequate knowledge studies the phenomena, and makes them the subject of a report.

We learn by an article in the *Revue Moderne*, that an epidemic of the kind described is prevalent in a place called Morzine, in Savoy. The superstitious folks declared that the devil possessed many of the inhabitants of this place, and M. J. Tissot, who writes the article from which our information is derived, proceeded to the spot. It appears that in 1857, a priest, born at Morzine, who tried to persuade the people that the devil had nothing to do with their illness, was suspected of having cast a diabolical spell over some of the young women. He was compelled to leave; but before departing they believed he communicated the fatal secret to certain individuals who continued the evil work. So the clergy and the laity fancied, and the local medical science, instead of correcting the delusion, became a convert to it. It was affirmed that exorcism had succeeded in a similar case that had occurred in the neighbourhood of Morzine, and for a time other means were abandoned in favour of a remedy that accorded with the state of the village mind. Witnesses that would have been accepted as

trustworthy in ordinary affairs, declared that the devil enabled the possessed to climb fir-trees like squirrels, and to stand on their heads when they reached the topmost branches, which, however delicate, were not bent under their weight. It was also affirmed that they manifested prodigious strength and remarkable eloquence, speaking Latin, German, and Arabic, which they had never learnt, describing faithfully battles they had never seen, and miraculously beholding from Morzine, transactions that took place at Geneva. In utter contradiction to their usual pious habits they blasphemed all holy things, and had a horror of religious exercises. They spoke of themselves in the third person—"he or she did so," which was explained to mean that the devil was speaking for them, and they were believed to know the secret thoughts of individuals whom they had never seen before.

These strange stories induced M. Tissot to visit the place, which he found occupied by a detachment of infantry and a brigade of *gensdarmerie*, sent by the government to maintain order, and with instructions to forward victims of the malady who were attacked in church or in public, to Thonon, Nyon, Cluny, and other places somewhat removed from the influences operating at Morzine. Fortunately superstition decided that the devil was not permitted to exercise his powers beyond Morzine, and the patients soon got well under the care of the government authorities.

M. Tissot visited a woman and her daughter who were said to be subject to possession. The latter, a girl of eighteen, had been sent to Cluny, and since her return had not experienced a convulsive crisis. She seemed out of health, and complained of pain in the epigastric region, and also of the *globus hystericus*, which makes sufferers fancy their hearts are coming up into their throats. Although better than she had been, she was not able to go to church, nor to pray, and the sound of the church bell was painful to her! She accompanied M. Tissot to her mother, and both spoke as if quite certain that they were possessed. The mother soon had an attack. Her arms were thrown backwards and forwards, the head thrown back on to the shoulders, and her body was agitated as if by a series of violent electric shocks. The convulsions were soon over, only lasting about a minute.

The following day, M. Tissot paid them a second visit, taking with him some wine and some pastry, in which he had put a little holy water taken by himself from the vessel in the church. When he arrived at the cottage, the party consisted of the hysterical mother and daughter, a little girl who watched their cattle up the mountain, the grandfather—an old soldier in the French armies—and his son, married to the

eldest of the women, and father of the two girls. They had received a kind, but injudicious letter from a nun in the establishment at Cluny, in which a good deal was said about the demon. M. Tissot read this aloud, till he came to passages he thought undesirable, when he stopped and returned the letter with an incredulous air. This, however, brought the conversation back to the subject he desired to avoid, and the mother had another attack like that of the previous day. The other members of the family exclaimed that nothing but exorcisms would suffice. M. Tissot reminded them that when exorcisms had been general, until forbidden by the bishop, the cases were more numerous. At first the suffering woman made no reply; but her convulsions grew more violent, and she began to declaim with great volubility. The devil seemed to speak through her mouth; he spoke in his own name and in that of the daughter, who would not leave her mother. After heartily abusing Mr. Tissot, she experienced eructation, and took some water, which seemed to calm her. During the paroxysm of this fit, she struck the table with her fists as if she would break it to pieces; but at its termination her hands were not particularly hot, nor was her pulse remarkably rapid or strong. M. Tissot then walked away with the old man, who strongly believed in the alleged possession, which his visitor attempted to counteract by telling of his trick with the holy water, which he was bound to believe the devil would have detected, and not allowed the woman to swallow.

M. Tissot states that this epidemic had at first a purely hysterical character, from which it passed through stages of convulsion and ecstasy to that of demonopathy.

For a time the judicious measures adopted by the Minister of the Interior were successful, and from a hundred and twenty patients in the spring of 1862, the number fell in the autumn to perhaps less than twenty. In 1863 the military force left Morzine, as it was hoped that the disorder had finally abated; but M. Tissot has recently received a letter informing him that a fresh outbreak has occurred, commencing at the announcement of a confirmation, and becoming so violent when the bishop arrived as to occasion alarming disorders in the church. The poor people who thought themselves possessed uttered frightful cries and blasphemies, tried to spit upon the bishop and take from him his pastoral ring. When the bishop pronounced his benediction the uproar became frightful, and occasioned the utmost consternation.

It is remarkable that only two men have been attacked by this epidemic, and that, with about ten exceptions, the patients have been women from eighteen to twenty-five years old.

The authorities are endeavouring to divert the minds of

the people, and it is hoped that when a road is finished between Thonon and Morzine, they will have more useful occupation, and come into greater contact with persons more reasonable than themselves.

HEIGHT OF THE AURORAL ARCH OF MARCH 20, 1865.

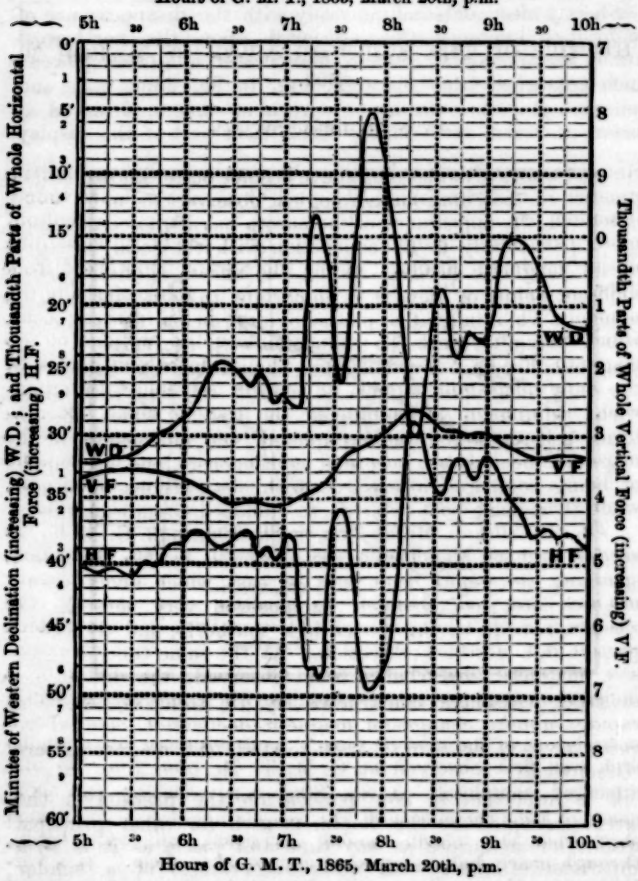
BY A. S. HERSCHEL, B.A.

SINCE the laws of meteorology have become better known, and the practice of recording meteorological observations more widely extended, the appearance of the aurora has attracted attention, more particularly in its connection with the local variations of the magnetic needle. When the aurora is observed from different points of view, it is important to note especially the moments when individual phases of its principal features occur, which may afterwards be connected with the motions of the magnetic needle. A connection should be established with the daily telegraphic signals, to identify the time with Greenwich, Edinburgh, or Dublin, at the first of which observatories self-registered photographs of the movements of the magnetic needles are recorded continuously, and are capable of being compared afterwards with observations of auroras, when these have been referred to standard Greenwich time.

On the 20th of March last, at 8h. 20m. p.m. G. M. T., an auroral arch at Manchester was observed by Mr. Baxendell, spanning the zenith from west to east, which about twenty minutes later had changed its position very sensibly, the western portion having moved in a southerly, and the eastern portion in a northerly direction. At the same time an extensive magnetic disturbance was observed, the index of a delicate instrument constructed by Dr. Joule for showing, rapidly, minute changes of magnetic declination being driven entirely out of the field of view. At Hawkhurst the luminous arch was first observed at G. M. T. 7h. 50m. p.m. It disappeared completely at 8h. 30m. p.m. During this short space of time the curves of the magnetometers at Greenwich show that the needle moved eastwards, and back again, through nearly half a degree of an arc of a circle. In a vertical sense, the needles remained nearly unaffected or oscillated in a less degree (see Fig. 1). Such an effect upon the magnetometers would be produced by a galvanic current, at the summit of the atmosphere, flowing from north to south, over

the needles, *in the direction of the magnetic meridian*. It appears not improbable that the arch was one segment of a luminous *stratified* discharge. An interchange of electricity

Fig. 1. Register of Greenwich Magnetometers.


Hours of G. M. T., 1865, March 20th, p.m.
5h
6h
7h
8h
9h
10h
Minutes of Western Declination (increasing) W.D.; and Thousandth Parts of Whole Horizontal Force (increasing) H.F.
Thousandth Parts of Whole Vertical Force (increasing) V.F.
W D
V F
H F
Hours of G. M. T., 1865, March 20th, p.m.

between the north and south hemispheres of the earth, in the form of an escape of galvanic electricity from the borders of the icy regions, was an explanation of the aurora originally

proposed by Fisher and (many years later) by De la Rive. Whether the principle of stratified discharges is adequate or insufficient to explain these great "semi-great-circles" that pass in succession over our heads, must be left to magnetologists to decide; for whenever there is aurora there is *infallibly* large magnetic disturbance.

Shortly after, or simultaneously with the disappearance of the arch, a luminous glow appeared upon the north-west horizon at Hawkhurst, Burton, Manchester, and other places; which continued from 8h. 40m. p.m. to 9h. 25m. p.m., and then gave place to a display of auroral streamers, observed at Burton-on-Trent and Windermere. This part of the display

Fig. 2. Change of Position in an Auroral Arch, March 20th, 1865.

appears to have been too distant to affect the magnetometers at Greenwich.

It is important to note particularly the position in the heavens occupied by the luminous arch (or other principal portions) of an aurora at any time and place, as it is by a comparison of these with other observations of a similar nature recorded elsewhere that the distance of the meteor from the earth can be calculated. The luminous arc observed at Hawkhurst, from 7h. 50m. p.m., to 8h. 30m. p.m., on the 20th of March, appeared as a narrow, well defined band of

milky light, four degrees wide, and considerably wider and brighter at last towards the western extremity. At that part the upper margin descended abruptly to meet the lower margin at the horizon, the lower margin itself presenting an unbroken and even curve from horizon to horizon. At 8h. 10m. p.m. the brightest or medial line of the arch (which was very near the lower margin) passed across the stars *κ Cygni*, and λ, *π Andromedæ*, from a point in the east horizon below *Corona*, to a point in the west horizon below the head of *Aries*, where the lower margin was met by the upper margin descending, from an altitude of five or six degrees, perpendicularly to the horizon. The upper margin was diffuse at all parts excepting near the western extremity, where the light was most intense, contrasting strangely with the pale, narrow riband of white light stretched out to the horizon in the east. In this position the arch continued stationary from 7h. 50m. p.m., to 8h. 20m. p.m., or nearly so; but at 8h. 25m. p.m. it was observed that the western extremity had risen five or six degrees from the horizon, the eastern extremity at the same time remaining unmoved, and gradually growing fainter. The medial or brightest line of the arch now passed through the stars *ι Herculis*, *δ Cephei*, *β Andromedæ*, and a point as far from *β Arietis*, as *β* from *α Arietis*.

By comparing these observations with observations of a similar nature recorded elsewhere, some idea of the height of the arch above the earth may be obtained. At Burton-on-Trent the luminous arc was first perceived at 7h. 50m., at an altitude of 45° above the north horizon, and at the end of fifteen minutes the altitude had increased to 60°. This is an indication, which cannot be mistaken, of the drift of the phenomenon (at one time of its appearance) bodily towards the south. At one time of its visibility it was nearly vertical over Windermere, and at another time nearly vertical over Manchester. Between these places the southward drift must have taken place. It was succeeded by an apparent elevation of the western extremity of the arch at Hawkhurst, and by a revolution of the arch, observed at all places, by which the western extremity was brought nearer to Hawkhurst, but the eastern extremity retreated towards the north. (See Fig. 1.)

Between 8h. and 8h. 30m. p.m. the arch passed over Windermere, and extended in length from the tail-stars of *Ursa Major* in the east, to between the *Pleiades* and *Venus* in the west. Comparing with this the first observation at Hawkhurst, where for a long time the arch was nearly stationary, it appears that at this time the light floated over Sca-fell at a height of 105 miles, and over Durham at a height of 110 miles, declining to a height of 81 miles over the North Sea, at one extremity, and

at the other extremity to a height of 77 miles over Ireland, a short distance inland from Louth, upon the Irish coast. (See Fig. 2.)

At 8h. 20m. p.m. the arch was nearly vertical at Manchester, extending from between *ε Tauri* and the *Pleiades*, across *Capella*, and across *α Ursæ Majoris*, to *ε Bootis*. As, soon after this time, the position of the arch underwent a change, by revolution in a direction contrary to the sun or to the hands of a watch, it may be supposed that at the time of the second observation at Hawkhurst (8h. 25m. p.m.) the apparent position of the medial line at Manchester had advanced to *ε Tauri* in one direction, and three or four degrees north of *ε Bootis* in the other. The second observation at Hawkhurst, compared with that at Manchester, gives nearly the same height as before—namely, the height of the centre 108 miles over Preston, in Lancashire, and the height of the two extremities, 75 miles over the North Sea, and 90 miles over the Irish Channel between Milford Haven and Queenstown. (See Fig. 2.)

The apparent flexure of the luminous arc at Hawkhurst, where it was seen in profile, was *greater* than what would arise from exact conformity of the arch to the curvature of the earth. This circumstance of a greater distance from the earth at the centre of the arch than at the two extremities, might lead to a different view of the constitution of the arch from that already advanced from the movement of the magnetic needle. It might, for example, be inferred that the arch was occasioned by a current of galvanic electricity flowing across the magnetic meridian, from the atmosphere of Denmark to the atmosphere of Ireland, or the reverse (see Fig. 2), and seeking the line of least resistance by rising to a summit in the atmosphere; the small change of vertical force compared with the great change of horizontal force, seen in the curves of the magnetometers (Fig. 1), appears to favour this conclusion. To establish the result of a greater height at the centre than at the two extremities as a general condition of their form, would require repeated observations, and these arcs are, unfortunately, numbered among the rarer features of the Aurora Borealis.

The following heights of three auroral arches, calculated by Dr. Dalton, are taken from the *Philosophical Transactions* for 1828, where they were pointed out to me since writing the above description.

(1). 1819, October 17th. Height between 100 and 102 miles, observed at Keswick and Gosport.

(2). 1826, March 29th. Height between 100 and 110 miles, observed at Jedburgh and Warrington.

(3). 1827, December 27th. Height nearly 100 miles, observed at Kendal and Manchester.

Regarding the near agreement with one another of these results, Dr. Dalton has the following remark:—"I am induced to believe that these luminous arches of the aurora, which occasionally appear stretching from east to west across the magnetic meridian, are all of the same height, *and that height about one hundred miles.*" The near agreement of this conjecture with the height of the auroral arch observed on the evening of the 20th of March confirms the general stability of their appearance, and makes the uniformity of their effect, as observed in the movements of the magnetic needle, a most interesting subject of inquiry.

THE AURORAL ARCH OF MARCH 20, 1865, AS SEEN IN IRELAND.

BY THE HON. MRS. WARD.

As I find that a late number of this magazine (that of April, 1865) contains some descriptions of an auroral arch seen in Scotland on February 15th, I am tempted to send two accounts of a similar phenomenon, seen on March 20th, together with my own observations upon it, at Bellair, King's county, lat. 53° 20′ 17″ and long. 7° 44′ W.

I am constrained, however, to describe it in the tone of the writer who, as stated in the article above referred to, "exclaimed," concerning the aurora of February 15th, that its wondrous beauty could hardly be described, and that it seemed to lead "onward to the golden gates of heaven." Exclamation must be employed in describing what I saw at ten minutes before eight on the evening of March 20th.*

The afternoon had been clear, a light wind blowing from the east. Several minutes before sunset I had detected Venus as a glittering point on the pale blue sky, and had occasionally glanced at the brilliant planet during the deepening twilight. About ten minutes before eight o'clock, I thought on looking towards the south, that the air had an unusually luminous aspect. The moon had not risen—surely the planet Venus could not throw such a light. I descended the doorsteps, and stood astonished! The light was, in short,

* This denotes Dublin time, as kept at the neighbouring railway station; the hour by Greenwich time was about 8h. 15m., and the aurora had probably been visible several minutes before I observed it.

caused by a magnificent auroral arch, commencing west of the constellation Taurus, rising to a great height, though not actually to the zenith, and terminating close to Arcturus, at a few degrees over the eastern horizon.

Its shape was of an extraordinary regularity, like a broad path of white light, and it was so intensely *visible*, and so sharply defined, that it occurred to me to compare it to the brazen meridian of a globe, realized as a luminous band. I viewed it at first with feelings not unmixed with alarm, yet more with deep admiration; then the thought, "It will soon fade away," led me to make the attempt to look at it with calmness, and note some points to impress on the memory.

But "look at it" is scarcely the expression to use. It was so large, the eye could not view it as a whole, but progressively, by following it along its sweep of *a hundred and forty degrees.*

It remained visible during about half an hour from the time when I first caught sight of it. When it disappeared, I began at once to write down what I had observed, and marked its place with black paint on the celestial globe. The notes made were to the following effect:—

When I first saw it, its left margin (southern) was much brighter than its right, especially at the western extremity, that is, near Taurus. Its breadth there was greatest, viz., about 8°. On turning round quickly and directing attention to the eastern end, that is, near Arcturus, I could observe it was narrower there, but could not trace any appearance of narrowing by carrying the eye along the arch from the western to the eastern end, as its sides then appeared to be parallel to each other. The general stillness of the arch was remarkable; there were, however, slight exceptions. A distinctly-marked dark cleft appeared in it, running up its centre lengthwise from the western end, to about its highest point. This cleft soon became less marked, seeming to close up abruptly. Another movement was to be observed for a few moments along the whole arch, its outline appearing waved, and again resuming its straightness. My view of the western end was impeded by the tops of trees; nevertheless, I have a distinct impression that it terminated very near the Hyades. The other end was in full view. It just passed Arcturus, and remained quite fixed there, the only change being that a small faint streak extended from this extremity to the horizon for a few moments, but quickly faded. This fixedness of position was by no means the case with the western extremity, for the arch, during its whole visibility, moved bodily at that end from a position close to Aldebaran to one close to Bellatrix in Orion. I mean that the right or north-

ern edge was close to Aldebaran at the beginning of the phenomenon, and that the left or southern edge was close to Bellatrix at its ending. And if I remember rightly, it passed over Pollux towards the end of the time, leaving Castor uncovered; but as I have already said, the extremity close to Arcturus showed no change of position. The gleaming of the stars through the arch was very beautiful. They showed through its delicate veil of light with undiminished brightness, just as they did through the tail of Donati's comet. Its light was exceedingly white, and was for awhile considerably brighter over Leo than elsewhere.

After making these notes mentally, I walked some way down an avenue which commands a view of the northern horizon, but saw no auroral appearances there. The arch became much narrower at the end of twenty minutes; and at the end of thirty minutes it was gone. About the manner of its disappearance I cannot speak very confidently, as my thoughts at the time were dwelling on the recollection of what it had been at its brightest.

I went out repeatedly during the evening to make sure of the stars near which it should be marked on the globe, and I saw no further appearance of aurora.

The following account of the phenomenon of March 20th appeared in the *Irish Times*, the writer (who signs "J. B.") stating that his place of observation was in lat. 53° 37′ 45″, and long. 8° 46′ 7″ W., which denotes a position near Tuam:—

"I beg to inform you of a remarkable display of the Aurora Borealis which I witnessed on the night of Monday, the 20th instant. Its principal feature was a very bright and well-defined band that crossed south of the zenith from west to east, passing under the planet Mars and over Orion, under Pollux, between Leo and Coma Berenices, and under Arcturus.

"The breadth of the band was about 8°, except toward the east, where it narrowed, and ended in a point at the confines of Bootes and Serpens; and it was divided through its whole length by a black line, which reminded me of the usual dark space in the tail of a comet. It swept across the sky with a beautiful double curve that faced the north in the meridian, and bent in the opposite direction as it approached Bootes. It had a slight motion towards the south until its edge touched Betelguese, at 7h. 50m., Dublin time, after which it remained stationary until its disappearance.

"The zodiacal light was very apparent in the west, and, though its limits could not be well defined on account of the aurora and the great brilliancy of Venus, yet it could be traced nearly to a point in the Milky Way, not far from where the latter was traversed by the luminous band. The north-

western sky was spread over with a light that often broke into coruscations of white and red. There were no clouds, and a freezing gale, which had been blowing all the day from the north-east, was now subsiding. The thermometer marked 23° on the grass, and the barometer, corrected to sea level, stood at 30·25 inches."

A correspondent of the *Times*, dating "Burton-on-Trent, March 20," and giving the initials "E. B. K.," says:—

"A very fine aurora was visible here this evening. At about 7.50 p.m., the sky being then perfectly clear and free from cloud or mist, a brilliant arch of white light was formed, spanning the whole northern horizon, and extending to an altitude of about 45°. This altitude rapidly increased to about 60° in a quarter of an hour. The western extremity, which was the brightest portion of the arch, tapered to a blunt point, ending abruptly about 10° above the horizon. At 8.20 a luminous mist appeared along the northern horizon. At 8.40 the arch had quite disappeared.

"At 8.45, an arch as perfect and as brilliant as the first, formed at a much lower elevation, not more than 20°. The sky included in the arch was then quite black. I did not observe any streaks to be thrown out till 9.25, when most brilliant streamers of white light, tinged on the west side with a faint roseate hue, shot up to a considerable altitude, forming a most imposing sight. Clouds then coming over, rapidly obscured the phenomena."

LITERARY NOTICES.

A Dictionary of Science, Literature, and Art, comprising the Definitions and Derivations of the Scientific Terms in general use; together with the History and Description of nearly every branch of Human Knowledge. Edited by W. F. Brande, D.C.L., F.R.S., L. and E. of Her Majesty's Mint; and the Rev. George W. Cox, M.A., Late Scholar of Trinity College, Oxford, assisted by Gentlemen of eminent Scientific and Literary Acquirements. (Longmans.) Parts I. and II.—We are very glad to see a new and enlarged edition of *Brande's Dictionary*, which bids fair to prove a very valuable and welcome work. Most of the explanatory articles appear to us very well written, but one of the gentlemen who does the physiology is by no means up to the mark. The whole of the explanation given under the title "Animal," is more or less open to objection, and some of it decidedly wrong, as when the writer, apparently knowing nothing of amœbæ, tapeworms, or gregarina, states that "animals are *always* provided with a mouth, and an internal cavity, or canal." Again, it is not correct to say that

"animals can convert into their own substance *only* matter which has been already organized." Surely they convert water into their own substances, and every medical man who administers a preparation of iron expects to find some of it assimilated by his patient. In the endeavour to establish more differences than exist between animals and vegetables, a want of care is exhibited, and we can make nothing of such statements as that "muscular fibre reacts when stimulated by an angular puckering called contraction," while in a sensitive plant there is "only an angular plication of a contiguous part." The writer of the article "Aberration" ought not to have contented himself with saying that the "mirrors of optical instruments are generally worked into a spherical form on account of the difficulty of obtaining the parabolic curvature." Mirrors not intended for accurate performance are undoubtedly so made, but those for reflecting telescopes are made parabolic, and an amount of accuracy is attained by the best makers that deserves more acknowledgment than the statement, "that attempts have been made to adapt them to the purposes of accurate observation." We have no doubt the editors will take care that errors of the sort we have indicated are avoided in future numbers, and our remarks must not be understood to convey the impression that anything like general carelessness has been shown.

A Year on the Sea Shore. By Philip Henry Gosse, F.R.S. With Thirty-six Illustrations by the Author. Printed in colours by Leighton Brothers. (Alexander Strahan.)—This is a very elegant and interesting volume that will prove a delightful companion for sea-side visits. There may not be in its pages so much for the advanced student as in some former works by the same author, but it is an admirable popular work, and contains vivid descriptions of a great variety of marine objects, many of which can be easily found by any sojourner on our coasts, who will take the pains to follow the instructions which are given. The plates are very good, though not quite up to the mark of those in *Tenby*, or the *Devonshire Coast*, and will render it easy to recognize many species of beautiful fishes, worms, mollusks, etc., to be obtained by searching amongst rock-pools, and other modes of pleasantly spending hours by the sea. When we consider Mr. Gosse's remarkable talent as a naturalist, his admirable facilities for observation, his brilliant powers of description, his skill as a microscopist, and his capacities as a draughtsman, we are extremely sorry to find his book closing with an announcement that "it will probably be the last occasion of his coming in literary guise before the public."

A Treatise on the Construction, Proper Use, and Capabilities of Smith, Beck, and Beck's Achromatic Microscope. By Richard Beck. Printed for Smith, Beck, and Beck, 31, Cornhill. Published by John Van Voorst, Paternoster Row. 1865.—This handsome large octavo volume contains a description, illustrated by numerous woodcuts and plates, of the various kinds of microscopes manufactured by Messrs. Smith, Beck, and Beck, and of all the principal pieces of apparatus employed in microscopic research. It

also contains the finest plates we have seen of the appearance of the Podura scale under various degrees of magnification, the *Arachnoidiscus Japenicus*, some of the most beautiful *Polycystina*, the so-called glands in deal, the *Demodex folliculorum*, and certain other objects. It is not generally known that a simple split fragment of a lucifer match offers, as Mr. Beck explains, the best and readiest mode of examining the structure of deal, which is beautifully displayed under a two-thirds object-glass. One of the plates gives the appearance of Norbert's lines as shown by an one-eighth, with the third eye-piece of Messrs. Smith and Beck's series, magnifying 1300 linear. As very few microscopists have had an opportunity of seeing Mr. Norbert's wonderful ruling on glass, we may state that his lines are arranged in twenty bands, varying in closeness from a ratio of 13 to 70 in one thousandth of an inch. Mr. Beck says that "an one-eighth of 120° aperture will show them all; but when cut down to 110° it will not separate the 20th band; at 100° the 17th (63 in 001″) is the limit; at 80°, the 14th (57 in 001″); and at 60°, the 10th (45 in 001″). Thus it will be seen that these lines afford excellent illustrations of the effect of varying angles of aperture, and they are more reliable than diatom lines, because there is not the same doubt as to their real degree of proximity, which varies in different specimens of the same diatom. For testing the excellence of correction, the Podura scale is the best object for high power, and with Mr. Beck's plates and directions the merit of any objective may be readily ascertained.

On the Distribution of Rain over the British Isles during the Year 1864, as observed at about 900 Stations in Great Britain and Ireland. With illustrations. By G. J. Symons, Member of the British and Scottish Meteorological Societies. (Stanford.)—The increasing body of persons interested in meteorological inquiries will welcome this laborious compilation, and Mr. Symons deserves great credit for the zeal with which he has extended observations on the rainfall of these islands. From explanations given by Mr. Symons, it appears that up to 1864 he defrayed the entire expense incidental to the collection of rainfall statistics, and that about £100 was contributed towards the expenses of that year. We certainly hope that some arrangement may be made by which the future collection of these important facts will not be permitted to throw upon Mr. Symons a loss of money as well as a great expenditure of time.

Sea and River-side Rambles in Victoria: being a handbook for those seeking recreation during the summer months. (Geelong, Heath and Cordell; London, Kirkland & Co.)—It is very pleasant to find a cheap and prettily illustrated handbook of the popular zoology and botany of Victoria. From the skill with which Mr. Hannaford has performed his task, we cannot doubt that he will induce many of our Australian friends to devote a little of their leisure time to the pursuit of natural history, which will not only be advantageous to themselves but useful to science, as their country is rich in objects of great interest.

THE OXFORD, CAMBRIDGE, AND DUBLIN MESSENGER OF MATHEMATICS, No. X. (Macmillan.)—As the title page informs us, this serial is "supported by junior mathematical students of the three Universities," and edited by William Allen Whitworth, and five other gentlemen well known in their respective circles. From the contents of the part before us, we have no doubt mathematical students will appreciate this publication, and find in it matter that might not be otherwise accessible.

THE CANADIAN NATURALIST AND GEOLOGIST. (Montreal, Dawson; London, Baillière.)—Successive numbers which reach us of this publication show that it maintains a high character as a scientific magazine; and many of the papers on local subjects will have a permanent value that naturalists and geologists will not fail to appreciate.

A FEW WORDS ON THE CHOICE OF A MICROSCOPE. By J. J. PLUMER, Esq., M.A. With illustrations. (Churchill.)—This reprint from the *Quarterly Journal of Microscopic Science* describes the principal forms of microscope in use, and the author's conclusion is that if a purchaser can afford it, he had better obtain one of the first-class instruments by one of the best makers.

GEOLOGY AND HISTORY: A popular exposition of all that is known of the Earth and its Inhabitants in Prehistoric times. By BERNHARD VON COTTA, Professor of Geology at the Academy of Mining, Freiberg, in Saxony. (Trübner.)—Mr. R. R. Noel presents the English public with a translation of the lecture by Professor Cotta, on the evidences that man is an old inhabitant of this globe, and on kindred subjects. It is more pretentious than explanatory to call a single short essay an explanation of all that is known of the earth and its inhabitants in prehistoric times; but Professor Cotta's lecture contains a good sketch of some of the principal facts relating to these questions, and forms a convenient little book for the general reader.

MAN CONSIDERED SOCIALLY AND MORALLY. By GEORGE SPARKES, Esq., Madras Civil Service. (Longmans.)—Mr. Sparkes tells us that for many years he has been in the habit of jotting down the most noteworthy opinions on social topics which he heard or read; and the present neat little volume is a *resumé* of his collections, united together with original matter in a shape that will be acceptable to those who may have neither the knowledge nor the opportunity for the extended literary researches which the author carried on for the gratification of his own mind.

PRACTICAL CHEMISTRY. By STEVENSON M'ADAM, Ph. D., F.R.S.E., F.C.S., Lecturer on Chemistry in the Medical School, Surgeons' Hall, and to the School of Arts, Edinburgh. Illustrated by woodcuts. (Chambers.)—Although we fully appreciate elaborate works, which must necessarily be expensive, we rejoice at the valuable efforts made by Messrs. Chambers, and other excellent publishers, to bring scientific information within the reach of large

classes, to whom a little money is a precious thing. This small, but very compendious volume on Practical Chemistry will, we have no doubt, assist students of medicine and arts, and advanced pupils in educational institutions, for whom it is especially intended; but it is also well adapted to the much larger class who must either go without knowledge, or be their own instructors. The title "Practical Chemistry" is scarcely explicit enough. What Dr. M'Adam has done is to compile a clear step by step exposition of qualitative analysis applied to the detection of substances most likely to occur in medicine and the arts. The arrangements appear to us very good for the double purpose of compression and easy reference. It would be a useful work for persons engaged in teaching ordinary school-classes, and we believe that before long no parent capable of paying a respectable price will tolerate any school in which physics, chemistry, and other practical sciences are entirely neglected. In all cases that admit of experiment or direct observation, the theoretical parts of science which constitute its value as a mental discipline, become much more intelligible after a requisite body of facts have been practically acquired, and it is absurd to consider that boys and girls are properly educated when they are left in total ignorance of the properties of substances and agencies upon which their existence and comfort depends.

How to Use the Barometer: a Companion to the Weather-Glass. (Bemrose and Sons.)—This little book consists of an almanack, with spaces for recording the state of the weather from day to day, prepared by explanations of barometers, thermometers, meteorological terms, etc.

London Meteorological Diagrams, showing the Daily Elements throughout the Year 1864. By C. O. F. Cator, M.A. (Sanford.)—By clever arrangement a very large amount of information is undeniably and strikingly arranged in this sheet. The daily fluctuations of the barometer for 1864, daily maximum and minimum temperatures, the Greenwich mean for each day, taken on the average of 43 years, direction of wind, weekly deaths from the Registrar-General's returns, age of moon, meridian altitude of sun, and other particulars, are made obvious on simple inspection. We hope Mr. Cator will receive adequate support in continuing this interesting work.

Homes without Hands. By the Rev. J. G. Wood. (Longmans.) Both the text and the illustrations of this interesting work keep up their character. Birds now occupy a considerable share of Mr. Wood's attention, and the portraits of the feathered builders and their abodes evince taste and skill.

ARCHÆOLOGIA.

The coast of Cheshire, extending from the mouth of the Dee to that of the Mersey, especially the part of it adjacent to the village of Hoylake, and forming part of the ancient hundred of Wirrall, has long been an object of interest to the antiquary, in consequence of the numerous antiquities, usually small objects, such as buckles, rings, brooches, etc., which have been continually picked up on the beach. These antiquities, which range from the Roman period until comparatively recent times, form the subject of a volume of considerable interest, by Dr. Hume, of Liverpool; and they now begin to assume increased interest in connection with geological questions, and that all engrossing question, the Antiquity of Man. These coasts, in fact, have no doubt undergone very great changes within no very great space of time. At a meeting of the Ethnological Society, last year, Professor Busk exhibited and described a skull, with other human bones, found, as it was said, under a layer of ancient peat, which itself lay under sandhills of very great elevation. Some little excitement was created by the discovery of these remains, which were at first believed to be those of a man of the prehistoric ages, but Professor Busk expressed the opinion that their antiquity was not great, and such proves, from an examination of the locality, to be the case. It shows how cautious we ought to be in forming conclusions of the antiquity of objects from the mere position in which they lie. As the antiquities alluded to, which are washed up by the tide or by the waves of the sea, continue to be picked up on the beach, without any apparent diminution of their numbers, they are continually furnishing new objects of interest; and we read with pleasure in the new number of that excellent periodical, the *Reliquary*, an account of the discoveries made in this neighbourhood during the last year, in an article by Mr. Ecroyd Smith, who has carefully surveyed the ground, and has given sections which explain much of the mystery in which these antiquities have been involved.

This coast, as just stated, is at present formed by great hills of loose, shifting sand, which rest upon a layer of marshy deposit of little depth, and of no very remote date. It was in or under this bed, which was mistaken by the finder for ancient peat, that the human remains were found, and they were probably those of a drowned man, whose body had been cast on the shore and hastily buried, as Mr. Ecroyd Smith thinks, within three hundred years of the present time. Next beneath this thin marshy deposit comes a much thicker bed of firm drift sand, in which are found mediæval articles, with occasionally a few remains of an earlier period at the bottom of it. This is followed by a still deeper bed of artificial arable soil, composed of bog and sand, mixed with a little marl. The objects found in this bed are also mediæval, including fragments of pottery, and bones of domestic animals, and among these was the Bos longifrons. As the antiquities found in this bed appear all to belong to the twelfth and thirteenth centuries, this discovery brings the continued existence of the Bos longifrons down

to a much later period than has hitherto been supposed. Immediately under this bed is another thinner stratum of blue marl or silt, with numerous petrified roots of Equiseta and other fresh-water plants, and among these have been found Saxon and Norman coins, and other objects belonging to those periods. This rests upon a thicker bed of forest bog soil, thickly filled with trees and shrubs, with many stumps of large forest trees, and here and there prostrate stumps. The animal remains in this bed include the deer, ox, horse, and wild boar, with land and fresh-water shells. The manufactured objects found in this bed are chiefly Roman, with a few articles, such as a coin, which are undoubtedly Saxon, and in the lower portions a few arrow-heads of flint, stone, and shell. Under this bed we come to one of about the same thickness of blue marl, containing remains of Bos Primigenius, and Megaceros Hibernicus, and Cetaceæ, but no traces of man's existence, except a few "primeval flints."

These various successive beds bear evidence to great changes which have taken place in this coast during a known period. During the Roman period, this district, now buried in sand, was covered by thick forests, which ran out far into what is now sea, and corresponded no doubt to the forests of which similar remains are found on the coast of North Wales. Opposite the Dove Point there was a considerable and elevated promontory, on which was a seaport in Roman and Saxon times, and upon Hilbre, or Helbre island, which was then much more extensive than at present, there was another Roman settlement, the site of which was occupied in the middle ages by a small monastic establishment. The objects of antiquity found during the past year on this coast, as enumerated by Mr. Ecroyd Smith, are about half a dozen Roman coins, two of which are of the Emperor Claudius Gothicus and Constantine the Great, and one of the small coins which numismatists call MINIMI, and which appear to belong to the close of the Roman period; a Roman brooch of the common harp-shape, and two pins of brooches, all in bronze, and the brooch enamelled. The mediæval objects are, a silver penny of Edward II., a pin with globular head, a needle two inches long, with the eye in a pointed head, a portion of a radiated thread-winder, part of a triangular needle, five plain and three ornamented studs of straps or belts, all of the mixed metal called in old English *latten;* a girdle-hasp of steel, and a portion of a large buckle, a flat ring of iron, and a quantity of fragments of pottery, ranging in date from the twelfth to the sixteenth century. Of later date were a shilling of James I., and several heads of clay pipes of the sixteenth and seventeenth centuries.

Very interesting discoveries have been made of late years near the village of WETTON in Staffordshire, close on the limits of Derbyshire, where numerous tumuli were formerly opened by Mr. Samuel Carrington and the late Mr. Bateman; but more recently much more extensive excavations made by the former gentleman have brought to view the floors and other remains of an extensive assemblage of residences evidently belonging to the Roman period and to people of a low class in society, possibly families connected with the Roman mining operations, as some lead ore were found. The

pavements were usually of rough limestones, or sometimes only of the earth beaten down, and they were covered with ashes, and with bones of animals, so that evidently the inhabitants, who must have lived largely upon flesh meat, threw the bones and refuse on the floor, and never troubled themselves to remove them. Pieces of broken pottery, of different degrees of fineness, were also scattered about the floors. An examination of these showed further that there had been no fixed place for the fire, but that it had been made capriciously anywhere on the floor. On one floor, which was more extensive than the others, and appeared to have belonged to a house of more lofty pretensions, were found, among other things, a small knife-blade, a pike, and a plain fibula, all of iron, and a beautiful bronze fibula, tastefully ornamented with yellow lozenges down the front. Part of a human skull was found on this floor. In others of these remains of ancient residences were found implements, or portions of implements, of various kinds, knives, a small two-pronged fork, broken querns for grinding corn, mortaria, and various other articles. In one instance the decayed remains of the four corner posts of the house were found, showing that it must have been surrounded by an area, probably of timber. Several coins have been found, but all Roman. Mr. Carrington's own account of his discoveries is printed in the *Reliquary*, and enters into very minute details, but we cannot agree with him in thinking that any of these remains belong necessarily to an earlier date than the Roman period.

Roman remains of some interest have been found at a place called Andoversford, in Gloucestershire, about fourteen miles from Gloucester, on the Avon. The chief value of the discovery, however, is that it seems to fix the site of a Roman station, called in the Itinerary of Richard of Cirencester, *Ad Antorium* (on the Avon), and lying between *Glevum* (Gloucester), and *Alauna* (Alchester), which has hitherto been a subject of considerable doubt.

Frequent discoveries of Roman remains of more than usual interest, both domestic and sepulchral, have been made along the line of the Roman road from *Venta* (Winchester), through the station of *Ad Lapidem* (site uncertain), to *Clausentum* (Bittern). One of the last of these which has occurred within the present year, is that of a Roman leaden coffin, near Bishopstoke, in Hampshire, by some men digging for gravel. The leaden coffin had been inclosed in a wooden one, which remained only in the shape of fragments of decayed wood. The coffin was made, as usual with Roman leaden coffins, out of one piece of cast lead, by cutting out the corners, and turning up the sides and ends. Inside was the skeleton of a female, with the broken fragments of apparently four vessels of pale green glass. One appeared to have had straight sides; another had presented somewhat the form of a soda-water bottle; and a third was of a more globular form. The glass was very thin, which is characteristic of a rather late date in the Roman period. The leaden coffin measured, internally, five feet six inches in length, by rather more than sixteen inches in breadth, and it was ten inches deep, so that the lady who was buried in it must have been small.

T. W.

PROCEEDINGS OF LEARNED SOCIETIES.

BY W. B. TEGETMEIER.

ETHNOLOGICAL SOCIETY.—*April* 11.

On the African or Occidental Negro.—Dr. Crawford gave a very impartial account of the physical and mental qualities of the true Negro race, as distinguished from the other dark races, with which it is not unfrequently confounded. In the true African Negro the hair is always black and woolly, the skin black, of various shades, the eyes dark, face flat, nose depressed, jaws projecting, with thick lips and large mouth, the incisor teeth being oblique. The skin possesses a peculiar odour unknown in any other races of men.

The true Negro is of the average height of Europeans, and is the only dark race possessing the same average amount of strength. From the Negroes must be distinguished the following African races—namely, the yellow Hottentots, the Abyssinians, the Samouli, and the Galli, all of whom have long hair and well-developed features. The civilization of the Negroes cannot be compared with that of the European races; it is even far inferior to that of many other races on their own continent. Their agriculture and manufactures are of the coarsest kind; they have no literature, and have rarely ever adopted the writings of other races.

Naturally the Negroes are a home-keeping, unadventurous race, neither war, commerce, or colonization ever having tempted them voluntarily to pass their natural boundaries. In the American States, where they are under restraint, the numbers keep pace with that of the white population. In our own colonies, where they are emancipated from slavery, their numbers decrease: thus, in Jamaica, in 1833, the number of blacks emancipated was 310,000; in 1844, the Negro population had fallen to 196,000. In Hayti, where the Negroes have been their own masters for half a century, the population is stationary.

April 25.

On the Capacity of Animals for Domestication.—In a paper read before the society, "On the Domestication of Animals in the Middle Ages," a very important, but generally overlooked, distinction between the different degrees of capacity for domestication was admirably stated. Animals may be classed as those capable of complete domestication, those capable of imperfect domestication, and those incapable of domestication.

The first class is very limited in number; it includes those animals which, when once reared by man, will not willingly leave him, and, if they do so accidentally, will endeavour to return. Among these are cows, sheep, horses, camels, dogs, poultry, and pigeons.

The second group is also very limited in number, it includes many animals that breed freely in confinement, but which, if they

escape from man, will not return willingly: pheasants, partridges, deer, hawks, etc., are samples of this group.

The third class, which comprises by far the greater number of animals, are altogether incapable of domestication; many will breed in confinement, but all will escape to savage life immediately that an opportunity offers.

These three classes are well marked, and it appears doubtful whether it is possible to transfer an animal from one to the other. Thus, notwithstanding the long series of years that pheasants have been reared in a state of semi-domestication, it is impossible to render them as perfectly domesticated as the common fowl. On the other hand, wild jungle-fowl and the wild rock-dove may be reared from the nest, and will become at once perfectly domesticated in their habits, a result which it is impossible to obtain with even the most closely allied species belonging to the same genera.

It is doubtless the want of attention to there psychical differences that has rendered the efforts of the European Acclimatization Societies so abortive; in fact, it is very doubtful whether any animals exist at present in a wild state, that are capable of being perfectly domesticated so as to be useful in civilized communities.

ROYAL GEOGRAPHICAL SOCIETY.—*April* 24.

On a New Passage Across the Isthmus of Panamá.—Mr. Laurence Oliphant read a short narrative of a journey which he had made from Panamá to the Chepo, or Bayanos River, which enters the Pacific about thirty miles to the westward of the former place. Between this point and the Gulf of St. Blas, the Atlantic and the Pacific approach nearer to each other than they do in any other part, and the object of the paper was to call attention to the fact that, during the many surveys which had been undertaken with a view to discern the most practical line for a ship canal, this part had been neglected. The neck of land which divides the Atlantic from that point on the Bayanos River to which the tide of the Pacific extends, is only fifteen miles across, and however incredible it might seem, the writer had not been able to learn that this short distance had ever been crossed, much less explored by a white man. In 1837, Mr. Wheelwright attempted it, but was driven back by the Indians, and some years later Mr. Evan Hopkins started with a view of exploring this route, but was compelled to abandon it for the same reason. The object of the writer in his visit was simply a reconnaissance, the persons in whose company he made the trip having no idea of exploration, but merely visiting the little settlement of Chepo, where they had bought an estate. He was unable to reach so far as Terabla, where the influence of the Pacific tides ends, and where an expedition to cross to the Atlantic would have to start from; but he saw from Chepo a very remarkable depression in the mountain chain, about ten miles distant. He was repeatedly assured, both at Panamá and at Chepo, that the Darien Indians were in the habit of hauling their canoes on wooden slides across the Cordillera, from the Mandinga

River, and launching them in the Bayanos. Surely it was a discredit to the civilization of the nineteenth century that the Indians should be said to pass with boats from the Atlantic to the Pacific, and that we should never have had the curiosity to verify this fact or explore the only section of the Isthmus of which it could be stated with any appearance of truth.

General Mosquera (Minister of the United States of Columbia) described the efforts which the Government of his country were making to open a road across the Cordillera at the point mentioned by Mr. Oliphant. This was one out of many enterprises which were now being pushed forward with a view to increase the commerce between New Granada and Great Britain in the abundant produce of that part of Tropical America.

May 8.

On the Temperature and Currents of the Seas between England and India.—Capt. Toynbee recorded the principal observations which he had made with instruments supplied by the Board of Trade, during five voyages to India, leaving England early in July and returning about the middle of April. It was the constant recurrence of certain phenomena in the condition of the sea, in the same place and at the same time of the year, that had led him to think they might be interesting as pointing to some important conclusions regarding the Physical Geography of the sea. He found, in the Atlantic, that the specific gravity of the sea decreased on approaching the equator, a result due to the rains falling between the North-east and South-east Trades; and in the Southern Indian Ocean, in the rainy season (January and February), the whole ocean was affected by the rains then falling south of the Line. With regard to temperature, his numerous observations during the five voyages threw some light on the cold current which swept in August northward along the west coast of Africa; this he found reason to conclude curved sharply to the westward shortly after crossing the Line in about 17° W. long.: the farther east of this the colder was the water; once, between 1° 30′ to 0° 30′ N. lat., he found its temperature to descend as low as 70° (Fahr.), making the air quite cool and damp. In March this current is of a higher temperature, because it has then flowed from the south after the southern summer. Capt. Toynbee confirmed the views of Towson regarding the direction of the tracks of icebergs in the South Atlantic, and showed that the very low temperature of the sea in Table Bay, sinking to 51° in February, was due to the current setting from the ice-bearing sea, and that this was also the source of the great West African current. A few miles to the south-east of the Cape the sea greatly increases in warmth, and along the parallel of about 40°, running from the meridian of Greenwich to 50° E., there was found in each voyage a succession of *lanes* of hot and cold water, the hot as high as 67° (Fahr.), and the cold sometimes as low as 40°. Were it not for the rush of warm water down the Mozambique channel, the ice-streams travelling north-eastward would not be deflected as now, to the south-

east, but would go forward and render the passage round the Cape much more dangerous than it is. Capt. Toynbee recommended outward-bound ships to delay crossing the fortieth parallel till the longitude of 10° E. is reached, and stated that as the sea on the Agulhas Bank is always several degrees colder than that to the eastward of it, the thermometer is a good guide to tell a ship when she is coming near the land.

ROYAL INSTITUTION.—*May* 19.

The Friday evening discourse was delivered by Mr. W. Huggins, on the CHEMICAL AND PHYSICAL CONSTITUTION OF THE STARS AND NEBULÆ. The heavenly bodies occupy a position of pre-eminence, as they afford the only means of obtaining information as to objects in the universe external to the earth; but the experimentalist has to cope with the difficulty that four out of the five senses fail him in the investigation. Light is our only means of communication; but still the distances, magnitudes, and motions of many of these bodies have been determined. As with sound, we can distinguish not only the note, but the kind of material producing it, whether wood, brass, or string; so light gives indications of the substance from which it emanates. Newton first decomposed light by a prism, and showed that some rays are spread out more than others. Wollaston and Frauenhofer discovered the dark lines crossing the spectrum, and these lines reveal the constitution of the body; but this was written in cipher till 1859, when Kirchhoff announced the mode of interpreting it. Spectra are of three orders. First, a continuous coloured band, which we know must be produced by an incandescent solid or liquid, but which gives no indication of the nature of the luminous substance. Second, a spectrum, consisting of a few bright lines, which is produced by a gas or vapour. Each substance has a spectrum of its own, and that of an unknown body; being compared with the known elements, we recognize certain similar groups of lines, and find what it is. The spectra of the electric light and the magnesium were shown, to illustrate these orders. The third kind is a coloured spectrum crossed with dark lines, and these lines are produced by the absorbing effect of vapours surrounding the incandescent body, each substance in the state of vapour being opaque to the light produced by the same substance when luminous. It is, therefore, obvious that when we find what dark lines correspond with the light lines produced by luminous vapours, we are sure those substances exist around or at the surface of the light giving body. Kirchhoff explained on this principle the constitution of the sun, and the lecturer had extended this mode of observation to the moon, planets, fixed stars, and nebulæ. Our *resumé* of the researches of Mr. Huggins and Dr. Miller, contained in the INTELLECTUAL OBSERVER for January, renders it unnecessary to repeat in detail these beautiful discoveries by which some of the elements in Aldebaran, Betelgeux, Sirius, and about fifty other stars, were determined. The lecturer dwelt upon the extraordinary absence of hydrogen from α Orionis, and speculated on the condition

of life in planets belonging to such a sun, and similarly deprived of oceans, clouds, and verdure. β Pegasi is the only other star constituted in like manner. Photographs of drawings of the stellar spectra having been shown by the electric lantern, the colours of double stars were referred to, and the spectra of Albireo (β Cygni) shown, in which the one star had numerous lines in the red, and then leaving the yellow predominant, and the other was full of lines in the red and yellow, allowing the blue to remain in the ascendant. Drawings of numerous nebulæ having been shown, Mr. Huggins then narrated his important discovery that a number of these extraordinary bodies, including the Planetary Nebulæ, the Ring and Dumb-bell Nebulæ, and the Great Nebula in Orion, had unexpectedly shown that they consisted of gaseous matter in a luminous state only, and that such gases were nitrogen, hydrogen, and an unknown substance. Those bodies which were clusters gave continuous spectra, and the nebula in Andromeda, although irresolvable in the telescope, gave the coloured band due to stars. The singular uniformity of composition, and the fact that only one line out of several nitrogen lines was visible, had given rise to much speculation. The conclusions drawn by the lecturer were—that with respect to the stars, they appear to consist, at least in part, of substances identical with those composing the earth and sun, and that the differences are those of adaptation and detail—not of plan or structure. That as the majority of elements found in the stars are those which are most connected with organic life here, it is reasonable to suppose that these stars are suns surrounded with planets like our central orb, and thus being, like it, the energizing centres of systems analogous to that of which our globe forms a part, and equally adapted to be the abode of living beings. On the other hand, it would result from the constitution of the nebulæ thus ascertained, that they are not necessarily at the enormous distance which the theory of their being clusters of stars, the light of which had blended into nebulosity, requires. The extreme simplicity of their chemical constitution also negatives the notion that they are examples of Sir W. Herschel's nebulous or primordial fluid, from which, by condensation, stars were formed, as, if so, we should find as many light lines in their spectra as there are dark ones in the fully formed stars; or if it be contended that they are in a more elementary state, and that our so-called elements are perhaps compounds, then, at least, some indications of progress would have been met with by greater complexity in a few of these bodies. On the whole, the lecturer believes that these true nebulæ are bodies possessing a structure and a purpose in relation to the universe altogether distinct and of another order from the great group of cosmical bodies to which our sun and the fixed stars belong.

COLOURS OF COR CAROLI.

On this subject we have received the following interesting letter from Mr. George Knott.

May 18th, 1865.

Dear Sir,—In accordance with your invitation in the May number of the Intellectual Observer, I have much pleasure in sending you the following estimate of the colours of the components of the double star, *Cor Caroli*.

1865, May 16. Instrument employed, a $7\frac{1}{3}$ inch Alvan Clark Refractor. Thornthwaite's Aplanatic, powers 102, 173.

A. Very pale yellow, almost white.
B. Pale lilac.

Using Admiral Smyth's chromatic scale the colours would be

A. Yellow^4.
B. Reddish purple^4.

I find in my Journal the following rather interesting observation of the colour of *B* of Cor Caroli *by daylight*. I quote from my Journal:—

"1862, Nov. 27, 10h. 15m. A.M. Had a fine view of the double star, Cor Caroli. The small star was in colour a little more dusky than the deep blue of the sky. I should call it deep dusky blue or lilac. $7\frac{1}{3}$ inch achromatic."

I think that it would be convenient in practice, particularly where *space* is precious (as, for instance, on a form for the entry of double star measures), to use a *large letter* to express the *disk colour* from the *scale*, and a *small letter* for the qualifying adjective. Thus, in the case of Cor Caroli, instead of writing the words, "yellow^4," "reddish-purple^4," we might write "Y^4," "rP^4." And in the same way the colour estimates of other stars might be recorded, as in the case of the following stars observed by me also on the 16th inst.:—

α Herculis A = O^3, B = bG^4.
95 Herculis A = G^4, B = O^3.
β Cygni A = Y^3, B = bG^4.

There may be cases, as you justly remark, in which a mere qualifying adjective will hardly suffice as indicative of tint; these it will not be easy to deal with. Any one with an artistic taste, and accustomed to *mix colours*, might perhaps indicate a tint by a *combination of several disk colours*. It is probable, however, that his combination would convey but a very indistinct idea of hue to the *uninitiated*.

Thornthwaite's aplanatics are very pleasant eye-pieces to use in colour estimations; unfortunately they labour under the disadvantage of a rather annoying *ghost*. It is necessary, too, to pay some little attention to the proper cleansing of the field lens, and in those I have the field is not perfect *to the edge*; there is a band of distortion which one would be glad to get rid of. In the "Monthly Notices,

R.A.S., Nov., 1862," Mr. Dawes remarks that Steinheil had for some years made an eye-piece, which was apparently identical with the "*Aplanatic* in construction."

[We have three of the Aplanatics, and have in our specimens very little fault to find with the field almost close to the edge. The "ghost" is, we believe, a reflexion inseparable from the construction. It causes a faint image of a bright object to move one way while the object appears to move in the other. By a little care the image and the ghost may be made to coincide.—ED.]

PROGRESS OF INVENTION.

NEW APPLICATIONS OF THE SYPHON.—It has been found, by Mr. Galletly, that different fluids pass through the very same syphon with different velocities—an observation made, indeed, by others; and also, that the same fluid passes with different velocities through syphons of the same length, but of different bores. Thus, while a vessel of water was emptied by a given syphon in forty-nine seconds, it required eighty-three to empty it of petroleum, and eighty-five to empty it of whiskey. Nor does the result depend, in any way, on specific gravity; for while paraffin oil was emptied in two hundred and eighty-six seconds, petroleum of the very same density required three hundred and seventy-five seconds. These, and similar experiments, suggested the syphon as a convenient means of ascertaining the difference between fluids, or the different degrees of purity of the same fluid, a standard vessel and syphon being employed for the purpose.

WATERPROOFING BY MEANS OF PARAFFIN.—The rendering of textile fabrics, leather, etc., waterproof, has long, and justly, been looked upon as a matter of considerable importance. Many means have, at various times, been employed for the purpose, but all, or most of them, have been found open to objection. Wax and drying oils were the substances first used, then caoutchouc, and afterwards gutta percha, both by itself and along with drying oils; recently, paraffin has been adopted, but, if used by itself, it crystallizes and separates from the fibres of the cloth, an inconvenience which is prevented by the addition of a small amount of drying oil. This mixture possesses the great advantage of rendering a fabric repellant of moisture, while at the same time it does not prevent the passage of air through it; and it affects but little, or not at all, the most delicate colours. It is particularly advantageous to leather, which it not only renders waterproof, but more durable and susceptible of a higher polish.

NEW MODE OF PRESERVING IRON.—In this, which may justly be denominated the "iron age," any effective mode of preserving that metal must be considered of great importance. Almost everything

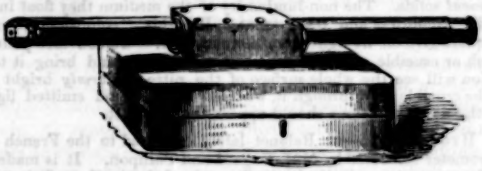
is now made of iron, and yet it is the most perishable of the ordinary metals. This circumstance becomes a source of serious anxiety when we reflect that the vast majority of our railway bridges are made of it. They cannot, as usually constructed, last more than a very few years; since, in a short time, the thin plates of which they chiefly consist, will become so corroded as to be no longer capable of supporting the weights they are required to bear. Various modes of preserving the iron have been tried, but unfortunately none of them have proved very effective; oxidation goes on under the very coating which is intended to exclude the atmosphere. There is, however, now reason to hope that ingenuity, which has vanquished so many difficulties, will conquer this also; and one step seems already to have been made towards the attainment of the desired object. It has been found that the combination of phosphorus with the surface of the iron, at a high temperature, completely preserves it; since the coating of phosphate of iron thus produced is a very stable compound, and one that is not acted upon by those agents which usually produce so mischievous an effect on iron. Should this mode of protection be found, in practice, and especially on the large scale, easy of application, economical, and effective, one of the most perishable may become one of the most lasting of metals, a circumstance that would add enormously to its value.

New Application of Chloride of Silver to Photography.—The deterioration of photographs has been the source of great disappointment or anxiety. Various means have been used for preventing it, but few of them have inspired much confidence, and it is yet uncertain if any of them will prove thoroughly effective. A recent application of chloride of silver, however, by Mr. G. Wharton Simpson, seems to exclude those conditions from which a change in photographs may be supposed to arise. He found that, if nitrate of silver is dissolved in collodion, and is changed into chloride by the addition of a few drops of a solution of chloride of sodium, the resulting chloride of silver is not precipitated, as might be expected, but remains, at least for a considerable time, suspended; so that although, by transmitted light, the collodion is perfectly transparent, by reflected light it is white like opal glass; and that, provided sufficient nitrate has been used, it gives a vigorous image on paper. It is extremely sensitive, and affords very good pictures with indifferent negatives, while even the Wothlytype requires that they should have considerable density. The collodio-chloride paper has many advantages over the albumenized. It is impossible that the latter can be of a uniform quality, since every succeeding sheet immersed in the solution of sensitive salts exhausts it, and diminishes its efficiency with regard to the next sheet. On the contrary, paper coated with the collodio-chloride is, to the very last sheet, of exactly the same strength. Perfect uniformity of effect is, therefore, easily attainable with it. But the most important circumstance connected with this preparation is the fact that, no soluble compound of silver being present, if the picture is properly fixed and washed, there is reason to believe that it will be permanent.

NOTES AND MEMORANDA.

THE DARK PART OF VENUS' DISC.—Dr. Engelmann, of the Leipzig Observatory, speaking of successful trials made with a new 8-inch glass of Steinheil, states that on the 20th of April the dark side of Venus was very strikingly seen. It appeared of a clear greenish-grey tint.

NEW SPECTROSCOPES.—The Herschel-Browning spectroscope, which has now been some months before the public, is recognized as the best instrument of its class, viz., that of direct vision spectroscopes having considerable dispersion, and obtaining the direct vision with little loss of light. It is composed of two prisms, each possessing direct vision, in consequence of the light ray experiencing two internal reflexions. As the principles involved in the construction of these instruments are of considerable interest, and can only be made clear by elaborate explanation and diagrams, Mr. Alexander Herschel has, at our request, supplied a paper on the subject, which will shortly appear, and we shall now only exhibit the form of the spectroscope devised by himself, and modified by Mr. Browning. We have taken several opportunities of looking through these spectroscopes, and have been much struck by the sharpness with which they exhibit, with a low power, a great multitude of dark lines. For quick examination of atmospheric lines, and for noting the changes that occur near the horizon, or in any particular direction, this form of spectroscope is the best yet devised, as it can be instantaneously and accurately pointed at any cloud or in any direction. Its dispersion and precision are so great as to divide the line D with a magnifying power of only 5.



In the Herschel-Browning spectroscope considerable dispersion is one of the objects sought and obtained; but, as we explained in our last number, there are occasions on which the dispersion should be comparatively small, and the instrument adapted to work with a minimum of light. Mr. Browning exhibited at the Royal Society's *soirée* an instrument of this kind, made for Mr. Gassiot. It consists of three prisms, united together by Canada balsam, to prevent loss of light by reflection at the surfaces of contact. The centre prism is of dense glass, and the two side ones of lighter glass, so adjusted as to counteract the refraction of the centre prism, and leave two-thirds of its dispersive power. We tried this instrument in various ways with much gratification. From its exquisite definition it exhibits the Frauenhofer lines in greater quantity and with more separation* than would have been expected, and with a careful management of light shows the blood absorption bands in extremely weak solutions. The solution we employed was obtained by macerating a very small morsel of raw meat in an ounce of cold water. A few drops of this solution, in about an ounce of water, gave a noticeable result, and we did not by any means arrive at the extreme limits of the power of the instrument. We must postpone a description of two other new spectroscopes exhibited by Mr. Browning at the Royal Society's *soirée*; one is the "Rigid Spectroscope" made for Mr. Gassiot, "to test whether any relationship exists between refraction and gravitation," and the other a striking optical instrument of recreation, "the Revolving Spectroscope, producing changing symmetrical figures of gorgeous colours in endless variety."

* The apparent separation depends partly on the amount of dispersion, and partly on perfection of definition. A good prism, like a good telescope, will show a division where a worse instrument with the same power would show coalescence.

USE OF COFFEE IN CRÉTINISM.—Dr. Chabrond states that during the last twenty years crétinism has been on the decrease in the arrondissement of Briançon, and, amongst other causes, he attributes the amelioration to the use of coffee. In a Bohemian village, in which the people were very poor, lived chiefly on potatoes, and exhibited a very low state of vitality, the medical men advised the use of coffee, and it has been found highly beneficial.

SECCHI AND HERSCHEL ON THE "WILLOW LEAVES" IN THE SUN.—The *Monthly Notices of the Astronomical Society* contain a letter from Father Secchi to the effect that he observes on the solar surface a multitude of bodies "like oblong filaments, or rather like bits of cotton wool of an elongated form." He thinks it very difficult to compare them with any terrestrial object, but considers the term "leaves" not badly chosen, except that they do not possess the regularity and uniformity of leaves. He observes likewise a great quantity of black pores, which seem to show that the photosphere is not a continuous stratum. He compares the sun's photosphere to what he once saw from Monte Cassino, when the valley beneath was full of clouds, and the sun darted his rays on an ocean of mi-t, except that the shadows are deeper in the sun than they were in the terrestrial clouds seen from above. He concludes that the luminous stratum of the sun is really made up of clouds, the only difference being, that while terrestrial clouds are composed of water-drops, or crystals, the sun-clouds are of some other substance. When a spot dissolves, he notices forms of *cumuli*, *cirri*, and *strati*, such as are seen in our skies. Sir J. Herschel, commenting on this letter, expresses the opinion that the floating bodies are "permanently solid matter, having that sort of fibrous or filamentous structure which fits them when juxtaposed by drifting about and jostling against one another to collect in flocks, as *flue* does in a room." Sir John does not assign any reason for regarding them as *permanent* solids. The non-luminosity of the medium they float in he ascribes to its being colourless and transparent. He adds, "colourless gases or transparent liquids give off no light from their interior. To convince yourself of this, take a dish or crucible, and melt a quantity of nitre, and bring it to a full red heat. You will see the whole surface of the nitre *uniformly* bright by the red heat of the crucible seen through it, whereas if the liquid emitted light from its *interior*, the deeper portions should appear the brightest.

NEW HYGROMETER.—M. Babinet lately exhibited to the French Academy a new hygrometer contrived by MM. Engard and Philipon. It is made of a spiral ribbon of ivory, cut perpendicular to the axis of the tooth. It is stated to be a very sensitive instrument, and to contract and dilate in a circular way.

NEW SOURCE OF THEINE.—Dr. Attfield, F.C.S., Director of the Laboratories of the Pharmaceutical Society, has a paper on this subject in the *Pharmaceutical Journal*. He finds theine to the extent of two per cent. in dried Kola-nuts, which form a favourite article of food and medicine in West Central Africa. Coffee, he states, contains from ·5 to 2·0 per cent. of theine, and tea from ·5 to 3·5 per cent. Dr. Attfield remarks that the presence of theine shows an analogy between the Kola-nut, and coffee, tea, Paraguay tea, and Guarana. "Infusions of one or other of these beverages are used probably by three-fourths of the human race, and each contains the same active principle—theine."

AXOLOTLS IN PARIS.—These curious reptiles, belonging to the Batrachian, or frog division, and remarkable, amongst other things, for having persistent gills, have been successfully treated in the *Muséum de Histoire Naturelle* in Paris, which possesses five males and one female. The latter laid a quantity of eggs on the 19th of January last, attaching them in parcels of twenty or thirty to solid bodies in the tank. The eggs resembled those of other batrachians, and the first hatching took place from twenty-eight to thirty days after the laying. The gills were at first much simpler than in the adult. In a few days the mouth opened, there being at first no aperture, and the little creatures eagerly devoured animalcules swimming in the water.